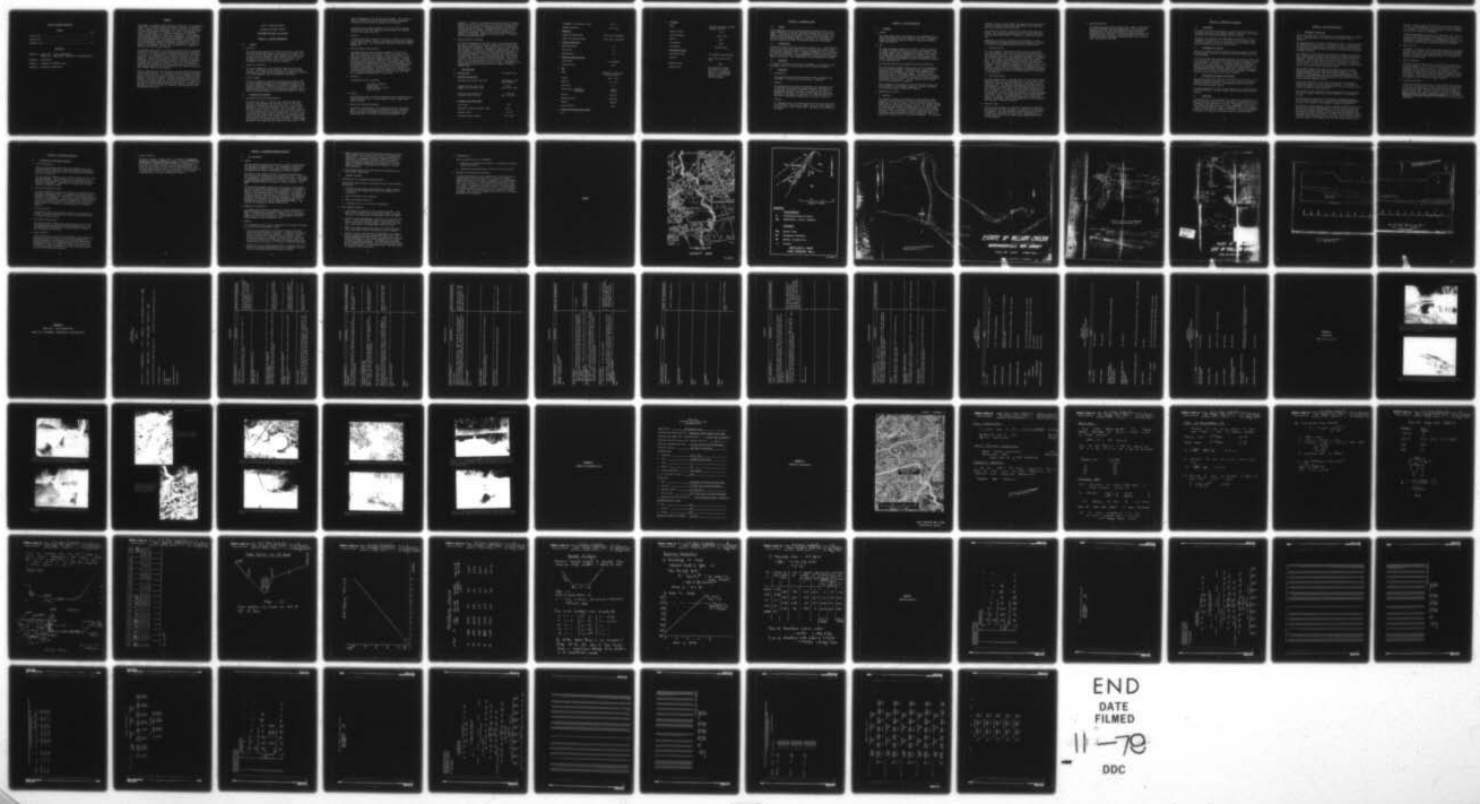
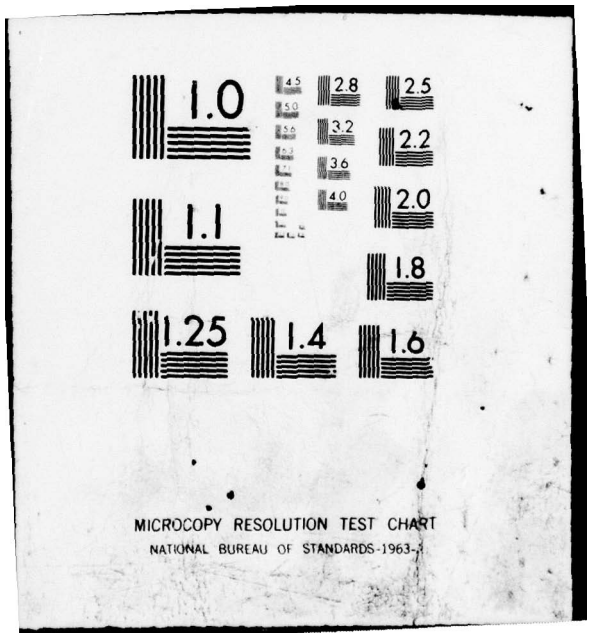
AD-A074 580 NEW JERSEY DEPT OF ENVIRONMENTAL PROTECTION TRENTON F/G 13/2
NATIONAL DAM SAFETY PROGRAM. VAN DORANS MILL DAM (NJ-00364), PA--ETC(U)
AUG 79 A G POSCH DACW61-79-C-0011

UNCLASSIFIED NL

/ OF
AD
A074 580



END
DATE FILMED
11-79
DDC


1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
4.5
5.0
5.6
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

PASSAIC RIVER BASIN
PASSAIC RIVER, SOMERSET COUNTY
NEW JERSEY

LEVEL II

VAN DORANS MILL DAM
NJ 00364

PHASE 1 INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM.

Van Dorans Mill Dam (NJ-00364). Passaic River Basin, Passaic River, Somerset County, New Jersey. Phase 1 Inspection Report.

(9) Final rept.,

(15) DACW61-79-C-0011

(10) Anthony G. /Posch

DEPARTMENT OF THE ARMY
Philadelphia District
Corps of Engineers
Philadelphia, Pennsylvania

(12) 91

(11) Aug[redacted]979

4/0 891

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER: NJ0036	2. GOVT ACCESSION NO.
3. RECIPIENT'S CATALOG NUMBER	
4. TITLE (and Subtitle): Phase I Inspection Report National Dam Safety Program Van Doran Mill Dam Somerset County, N.J.	5. TYPE OF REPORT & PERIOD COVERED: FINAL 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s): Bosch, Anthony G., P.E.	8. CONTRACT OR GRANT NUMBER(s): DACW61-79-C-0011
9. PERFORMING ORGANIZATION NAME AND ADDRESS: Harris-ECI 453 Amboy Ave. Woodbrige, N.J.	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS: U.S. Army Engineer District, Philadelphia Custom House, 2d & Chestnut Streets Philadelphia, Pennsylvania 19106	12. REPORT DATE: August, 1979 13. NUMBER OF PAGES: 40
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)	15. SECURITY CLASS. (of this report): Unclassified 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Copies are obtainable from National Technical Information Service, Springfield, Virginia, 22151.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Van Doran Mill Dam, N.J.
Visual Inspection
Dams
Spillways
Structural analysis
Visual Inspection
National Dam Inspection Act Report.

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report cites results of a technical investigation as to the dam's adequacy. The inspection and evaluation of the dam is as prescribed by the National Dam Inspection Act, Public Law 92-367. The technical investigation includes visual inspection, review of available design and construction records, and preliminary structural and hydraulic and hydrologic calculations, as applicable. An assessment of the dam's general condition is included in the report.

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
CUSTOM HOUSE—2 D & CHESTNUT STREETS
PHILADELPHIA, PENNSYLVANIA 19106

IN REPLY REFER TO
NAPEN-D

Honorable Brendan T. Byrne
Governor of New Jersey
Trenton, NJ 08621

25 SEP 1979

Dear Governor Byrne:

Inclosed is the Phase I Inspection Report for Van Dorans Mill Dam in Somerset County, New Jersey which has been prepared under authorization of the Dam Inspection Act, Public Law 92-367. A brief assessment of the dam's condition is given in the front of the report.

Based on visual inspection, available records, calculations and past operational performance, Van Dorans Mill Dam, a high hazard potential structure, is judged to be in fair overall condition. The dam's spillway is considered inadequate since 11 percent of the Spillway Design Flood--SDF - would overtop the dam. (The SDF, in this instance, is one half of the Probable Maximum Flood). The decision to consider the spillway "inadequate" instead of "seriously inadequate" is based on the determination that dam failure resulting from overtopping would not significantly increase the hazard to loss of life downstream from the dam from that which would exist just before overtopping failure. To insure adequacy of the structure, the following actions, as a minimum, are recommended:

a. The spillway's adequacy should be determined by a qualified professional consultant engaged by the owner using more sophisticated methods, procedures, and studies within six months from the date of approval of this report. Any remedial measures necessary to insure the adequacy of the spillway and to prevent overtopping should be initiated within calendar year 1980. In the interim, a detailed emergency operation plan and warning system should be promptly developed. Also, during periods of unusually heavy precipitation, around-the-clock surveillance should be provided.

b. Within six months from the date of approval of this report, engineering studies and analyses should be performed to determine the dam's embankment and foundation condition and structural stability. This should include test borings to determine material properties relative to stability and seepage and installation of observation wells or piezometers to facilitate seepage studies. Any remedial measures found necessary should be initiated within calendar year 1980.

c. Within three months from the date of approval of this report the existing drawings of the dam should be annotated and updated and made a part of the permanent records of the dam.

d. The following remedial actions should be completed within six months from the date of approval of this report:

(1) A safe means of lowering the lake should be provided. This would involve restoring the existing outlet pipe to operable condition. The owner should also consider providing additional low-level outlet facilities.

(2) Provide concrete underpinning at the toe of the spillway abutments. In the right abutment, replace missing stones with concrete and repoint existing stones. Rebuild the left abutment.

(3) Repair the concrete surface and apron of the spillway structure, using epoxy concrete and reinforcing where required.

(4) Remove all trees and brush from the embankments and abutments to avoid problems which may develop from their roots. The entire downstream face should then be inspected for cracks and unusual settlements or loss of fill material and the extent of animal burrowing determined. The downstream face should then be repaired where required, and the animal burrows filled. Add rip-rap protection to the upstream face.

e. The following remedial actions should be completed within one year from the date of approval of this report:

(1) A formalized program of annual inspections of the dam by an experienced party should be initiated, utilizing the standard visual check list in this report. Headwater and tailwater gages should be installed in the dam and read during and after severe rain storms and during routine operating and maintenance visits to the dam. A permanent log should be kept of all maintenance and operating events of the dam and the lake. Possible movement of the dam should be monitored regularly by means of surveying monuments.

(2) A program should be developed to monitor the seepage through and under the dam. Depending on the information provided, the need for corrective measures can be considered and, if necessary, undertaken.

A copy of the report is being furnished to Mr. Dirk C. Hofman, New Jersey Department of Environmental Protection, the designated State Office contact for this program. Within five days of the date of this letter, a copy will also be sent to Congresswoman Millicent Fenwick of the Fifth District. Under the provision of the Freedom of Information Act, the inspection report will be subject to release by this office, upon request, five days after the date of this letter.

Additional copies of this report may be obtained from the National Technical Information Services (NTIS), Springfield, Virginia 22161 at a reasonable cost. Please allow four to six weeks from the date of this letter for NTIS to have copies of the report available.

An important aspect of the Dam Safety Program will be the implementation of the recommendations made as a result of the inspection. We accordingly request that we be advised of proposed actions taken by the State to implement our recommendations.

Sincerely,

JAMES G. TON
Colonel, Corps of Engineers
District Engineer

1 Incl
As stated

Copies furnished:
Mr. Dirk C. Hofman, P.E., Deputy Director
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

Mr. John O'Dowd, Acting Chief
Bureau of Flood Plain Management
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

VAN DORANS MILL DAM (NJ000364)

CORPS OF ENGINEERS ASSESSMENT OF GENERAL CONDITIONS

This dam was inspected on 4 May 1979 by Frederic R. Harris Inc. under contract to the State of New Jersey. The State, under agreement with the U.S. Army Engineer District, Philadelphia, had this inspection performed in accordance with the National Dam Inspection Act, Public Law 92-367.

Van Dorans Mill Dam, a high hazard potential structure, is judged to be in fair overall condition. The dam's spillway is considered inadequate since 11 percent of the Spillway Design Flood--SDF - would overtop the dam. (The SDF, in this instance, is one half of the Probable Maximum Flood). The decision to consider the spillway "inadequate" instead of "seriously inadequate" is based on the determination that dam failure resulting from overtopping would not significantly increase the hazard to loss of life downstream from the dam from that which would exist just before overtopping failure. To insure adequacy of the structure, the following actions, as a minimum, are recommended:

a. The spillway's adequacy should be determined by a qualified professional consultant engaged by the owner using more sophisticated methods, procedures, and studies within six months from the date of approval of this report. Any remedial measures necessary to insure the adequacy of the spillway and to prevent overtopping should be initiated within calendar year 1980. In the interim, a detailed emergency operation plan and warning system should be promptly developed. Also, during periods of unusually heavy precipitation, around-the-clock surveillance should be provided.

b. Within six months from the date of approval of this report, engineering studies and analyses should be performed to determine the dam's embankment and foundation condition and structural stability. This should include test borings to determine material properties relative to stability and seepage and installation of observation wells or piezometers to facilitate seepage studies. Any remedial measures found necessary should be initiated within calendar year 1980.

c. Within three months from the date of approval of this report the existing drawings of the dam should be annotated and updated and made a part of the permanent records of the dam.

d. The following remedial actions should be completed within six months from the date of approval of this report:

(1) A safe means of lowering the lake should be provided. This would involve restoring the existing outlet pipe to operable condition. The owner should also consider providing additional low-level outlet facilities.

(2) Provide concrete underpinning at the toe of the spillway abutments. In the right abutment, replace missing stones with concrete and repoint existing stones. Rebuild the left abutment.

(3) Repair the concrete surface and apron of the spillway structure, using epoxy concrete and reinforcing where required.

(4) Remove all trees and brush from the embankments and abutments to avoid problems which may develop from their roots. The entire downstream face should then be inspected for cracks and unusual settlements or loss of fill material and the extent of animal burrowing determined. The downstream face should then be repaired where required, and the animal burrows filled. Add rip-rap protection to the upstream face.

e. The following remedial actions should be completed within one year from the date of approval of this report:

(1) A formalized program of annual inspections of the dam by an experienced party should be initiated, utilizing the standard visual check list in this report. Headwater and tailwater gages should be installed in the dam and read during and after severe rain storms and during routine operating and maintenance visits to the dam. A permanent log should be kept of all maintenance and operating events of the dam and the lake. Possible movement of the dam should be monitored regularly by means of surveying monuments.

(2) A program should be developed to monitor the seepage through and under the dam. Depending on the information provided, the need for corrective measures can be considered and, if necessary, undertaken.

APPROVED: James G. Ton

JAMES G. TON
Colonel, Corps of Engineers
District Engineer

DATE: 23 Sep 1979

PHASE I INSPECTION REPORT

NATIONAL DAM SAFETY PROGRAM

Name of Dam: Van Dorans Mill, I.D. NJ00364

State Located: New Jersey

County Located: Somerset County

Stream: Passaic River

Date of Inspection: May 4, 1979

Assessment of General Condition

Van Dorans Mill Dam is a 15-foot high earth-fill dam with a clay core, approximately 940 feet long, and has an ungated 57-foot long spillway on the extreme right side.

The general condition of Van Dorans Mill Dam appears to be fair. Its hazard classification is "high." The stone-covered abutments of the spillway structure have deteriorated moderately at the right abutment and severely at the left abutment. The concrete spillway surface and apron are spalled and contain cracks. The concrete spillway apron is chipped at one corner and the plunge pool has deepened, exposing the base and cut-off wall of the spillway. The embankments do not have any rip-rap protection and they are covered with a heavy growth of trees and brush. The left embankment is pocked with animal burrows. There are signs of seepage at the toe of the left embankment. The low-level outlet is not presently operable.

The safety of Van Dorans Mill Dam is considered questionable in view of its lack of spillway capacity to pass one half the PMF without overtopping the dam. The spillway is capable of passing a flood equal to 5% of the PMF, and is assessed "inadequate." Records show that the dam was overtopped in 1940 during hurricane Doria, at which time two gullies were formed. The overtopping was attributed to the failure of Sherman Dam, located directly upstream. Since then, Sherman Dam has been rebuilt and a new and larger spillway constructed at Van Dorans Mill Dam.

At present, the engineering data available are not sufficient to make a definitive statement on the stability of the dam.

The following actions, therefore, are recommended along with a time-table for their completion.

1. The existing drawing of the dam should be annotated and updated to form a coherent as-built set, within three months.

2. Establish a flood-warning system for the downstream community, within three months.

3. Carry out a more precise hydrologic and hydraulic analysis of the dam within six months, to determine the need and type of mitigating measures necessary. If required, conduct a study of the means of increasing spillway discharge capacity and develop alternative schemes for construction. This should include the installation of headwater and tailwater gages.

4. Install observation wells or piezometers in the downstream embankment, and log the borings to determine engineering properties of the dam fill and foundation material. This program and a stability analysis based on the findings should be completed within six months.

5. Remove all trees and brush entirely from the dam embankments and abutments, within six months, and seed with grass for surface erosion protection within 12 months.

6. Carry out remedial measures to the dam structure, within six months, including repair of the stone abutments of the spillway, repair of the spalled and cracked spillway surface with epoxy cement, repair of the spillway apron, addition of stone protection at the base of the spillway apron, filling of the burrowed holes on the downstream face with quarry-run stone, and addition of rip-rap protection on the upstream face.

7. Restore the low-level outlet's operating mechanism. This work is to be done within six months.

Furthermore, while of a less urgent nature, the following additional actions are recommended and should be carried out in the near future.

1. A program should be developed to monitor the seepage through and under the dam. Depending on the information provided, the need for corrective measures can be considered and, if necessary, undertaken.

2. A program of annual inspection and maintenance should be initiated. This should include lowering the lake, and updating the operation and maintenanace log. Movement and settlement of the embankment should also be monitored by means of surveying monuments.

3. Provision of additional low-level outlet facilities should be considered.

A.G. Posch

AGP/REJ/ak

Anthony G. Posch, P.E.

Van Dorans Mill Dam
Overall view of spillway from downstream.

May 4, 1979

TABLE OF CONTENTS

ASSESSMENT OF GENERAL CONDITIONS

PREFACE

		Page
SECTION 1	PROJECT INFORMATION	1
	1.1 General	1
	1.2 Description of Project	1
	1.3 Pertinent Data	3
SECTION 2	ENGINEERING DATA	6
	2.1 Design	6
	2.2 Construction	6
	2.3 Operation	6
	2.4 Evaluation	6
SECTION 3	VISUAL INSPECTION	7
	3.1 Findings	7
SECTION 4	OPERATIONAL PROCEDURES	10
	4.1 Procedures	10
	4.2 Maintenance of Dam	10
	4.3 Maintenance of Operating Facilities	10
	4.4 Evaluation	10
SECTION 5	HYDRAULIC/HYDROLOGIC	11
	5.1 Evaluation of Features	11
SECTION 6	STRUCTURAL STABILITY	13
	6.1 Evaluation of Structural Stability	13
SECTION 7	ASSESSMENT/REMEDIAL MEASURES	15
	7.1 Dam Assessment	15
	7.2 Remedial Measures	16

TABLE OF CONTENTS CONTINUED

PLATES

	No.
VICINITY MAP	1
GEOLOGIC MAP	2
DRAWINGS OF DAM	3-5

APPENDICES

APPENDIX A - CHECK LIST - VISUAL OBSERVATIONS
CHECK LIST - ENGINEERING, CONSTRUCTION, MAINTENANCE DATA

APPENDIX B - PHOTOGRAPHS

APPENDIX C - SUMMARY OF ENGINEERING DATA

APPENDIX D - HYDROLOGIC COMPUTATIONS

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

PHASE I INSPECTION REPORT

NATIONAL DAM SAFETY PROGRAM

VAN DORANS MILL DAM, I.D. NJ00364

SECTION 1: PROJECT INFORMATION

1.1 General

a. Authority

The National Dam Inspection Act (Public Law 92-367, 1972) provides for the National Inventory and Inspection Program by the U.S. Army Corps of Engineers. This inspection was made in accordance with this authority under Contract C-FPM No. 35 with the State of New Jersey who, in turn is contracted to the Philadelphia District of the Corps of Engineers.

b. Purpose of Inspection

The visual inspection of Van Dorans Mill Dam was made on May 4, 1979. The purpose of the inspection was to make a general assessment as to the structural integrity and operational adequacy of the dam embankment and its appurtenant structures.

c. Scope of Report

The report summarizes available pertinent data relating to the project; presents a summary of visual observations made during the field inspections; presents an evaluation of hydrologic and hydraulic conditions at the site; presents an evaluation as to the structural adequacy of the various project features; and assesses the general condition of the dam with respect to safety.

1.2 Description of Project

a. Description of Dam and Appurtenances

Van Dorans Mill Dam is a 15-foot high, earth-fill dam with a clay core, approximately 940 feet long, with a 57-foot long spillway on the extreme right side of the dam. The earth-fill embankment's upstream and downstream faces are sloped 1.5H:1V and its top width is about 15 feet. A mill-stream is located on its right abutment and the right channel bank. The spillway is an ungated ogee overflow made of an earth fill-core with a reinforced concrete surface slab on grade and a reinforced concrete vertical upstream face. The original spillway was smaller and was located on the extreme left side of the dam. A dam collapse upstream of Van Dorans Mill Dam, during hurricane Doria in 1940,

caused overtopping of the dam and partial damage. The following year, the present spillway was constructed and the embankment extended on the left bank to replace the old spillway.

A low-level outlet pipe was added on the right side of the new spillway with a wet well shaft and sliding gate at the upstream face of the concrete core wall.

b. Location

Van Dorans Mill Dam is located on the private estate of the owner, to the north of Basking Ridge, in the Township of Bernards, Somerset County, New Jersey. It is accessible from Childs Road, off Federal Highway 202.

c. Size and Hazard Classification

Van Dorans Mill Dam has a structural height of 15 feet and a reservoir storage of 55 acre-feet. Since its storage is less than 1,000 acre-feet and its height is less than 40 feet, it is classified in the dam size category as being "small." A hazard potential classification of "high" has been assigned to the dam on the basis that failure would result in excessive damage to the road and services downstream of the dam and to downstream property. The possibility exists of the loss of more than a few lives in the event of overtopping or dam failure due to the presence of occupied buildings within 1,000 feet downstream of the dam. Those in the greatest potential danger are a house on the right bank, and a restaurant downstream of U.S. Route 202.

d. Ownership

Van Dorans Mill Dam is owned by:

Mr. Jack A. Ziebarth
Childs Road
Basking Ridge, NJ 07920
(201) 221-0012

e. Purpose

Van Dorans Mill Dam is presently used for private recreational and esthetic purposes only. It was originally used to supply water power to a mill.

f. Design and Construction History

The date of construction of the original dam has not been determined. In 1940, hurricane Doria caused the failure of Sherman Dam, lying directly upstream, and produced overtopping on Van Dorans Mill Dam. As a result, the dam was breached at both

abutments. In 1941-42, the present spillway was built in replacement of the smaller original spillway, which was situated at the extreme left of the dam. The earth dam was also extended where the old spillway had stood. Drawings prepared for the 1941-42 reconstruction are available at NJDEP, but the design was not completely documented. The only calculations available are in regard to the discharge capability of the spillway. The dam has not been modified since 1942.

g. Normal Operating Procedures

The normal discharge from the lake is over the unregulated spillway and it is allowed to naturally balance with the inflow from the Passaic River upstream. The low-level outlet is not operable and the lake is therefore not lowered on a regular basis. On the right abutment, a sluice gate discharges water from the lake into the old mill-stream, which runs on the right bank, parallel to the downstream channel. The invert elevation of the mill-stream is about half a foot lower than the spillway crest, and the flow is about 3 cfs with the lake at spillway elevation. The sluice gate is in the closed position, with an orifice in the gate allowing the mill-stream to run full at all times. Residents of the nearby houses clear and maintain the mill-stream for esthetic purposes only.

1.3 Pertinent Data

a. Drainage Area	8.8 square miles
b. Discharge at Dam Site:	
Maximum known flood at dam site:	Overtopping (1940 flood, NJDEP).
Ungated spillway capacity at maximum pool elevation (SDF)	11,934 (elev. 258.2' MSL)
Total spillway capacity at elevation of top of dam:	1,121 cfs (elev. 255' MSL)
c. Elevation (Feet Above MSL)	
Top of dam:	255'
Maximum pool design surcharge (SDF):	258.2'
Spillway crest:	252.13'
Low-level outlet (invert):	245' (est.)

Streambed at centerline of dam:	241.3'
Maximum tailwater:	251' (est.)

d. Reservoir

Length of maximum pool:	1500 ± feet (estimate)
Length of recreation pool:	1000 ± feet (estimate)

e. Storage (Acre-feet)

Recreation pool:	30
Top of dam:	55
Maximum pool:	94

f. Reservoir Surface (Acres)

Top of dam:	13 (estimate)
Spillway crest:	6.94

g. Dam

Type:	Earth-fill, clay core, concrete spillway.
Length:	940' (est.)
Height:	15' (est.)
Top width:	15'
Side Slopes - Upstream:	1.5H:1V
- Downstream:	1.5H:1V
Zoning:	Unknown
Impervious core:	Clay core
Cutoff:	Unknown
Grout curtain:	None

h. Diversion and Regulating Tunnel

N/A

i. Spillway

Type:	Concrete ogee slab or grade, ungated overflow.
Length of weir:	57.0'
Crest elevation:	252.13' MSL
Gates:	None
U/S Channel:	None
D/S Channel:	Passaic River

j. Regulating Outlets

Low-level outlet:	24" diameter concrete pipe.
Controls:	Iron sliding gate in wet well.
Emergency gate:	None
Other outlet:	Mill-stream with steel sluice gate in closed position. A rectangular orifice cut through gate allows a flow of 3 cfs into mill stream.

SECTION 2: ENGINEERING DATA

2.1 Design

Brief computations for the present spillway discharge capacity, and three drawings of the dam and the present spillway are on file at the NJDEP. A construction permit application of 1941 gives overall dam dimensions and hydrologic capacity. No data from soil borings, soil tests or other geotechnical data are available. No computations or dam cross-sections suitable for assessing stability are available.

2.2 Construction

Construction history has been provided in Section 1.2.f. Three drawings are on file, which contain details of the modifications made in 1942, and have been reproduced herein. Further information on the construction of the dam is available in the correspondence between the owner of the dam, the design engineer, and the Department of Environmental Protection, Trenton, New Jersey. This information is on microfiches at the NJDEP.

2.3 Operation

No records of operation of the dam are available. No operations exist at present, and it is not known when the mill-ceased to operate.

2.4 Evaluation

a. Availability

The stated drawings and microfiches were freely available from the NJDEP. No other project information is available.

b. Adequacy

The engineering data available (hydrologic and topographic data of the area) was adequate to perform hydrologic and hydraulic computations, although the depth of the lake is not known. A preliminary assessment of the dam could be made with the data obtained in the field, but there was not sufficient data to perform even an approximate computation of the dam's stability.

c. Validity

The embankment has a considerably smaller section than that shown in the original (1941) drawing, which calls for 2H:1V slopes on both faces and a 30-foot wide crest. The scale of the drawing is not known.

SECTION 3: VISUAL INSPECTION

3.1 Findings

a. General

The visual inspection of Van Dorans Mill Dam revealed that the dam and spillway were in fair condition, but that a program of repairs and regular inspection would be required to maintain their serviceability.

b. Dam

The earth embankment appears to be stable. Further inspection is needed to determine if there are any surface cracks. Tree and brush growth on the downstream face is very dense and must be removed before further inspection is possible. The trees have a maximum estimated height of 50 feet and diameter of 18 inches. There is also abundant evidence of burrowing by animals on the downstream face.

The upstream face was not provided with rip-rap protection.

Two large pools of stagnant water at the toe of the embankment point to possible seepage. A drainage ditch, located about 60' downstream, runs parallel to the entire left embankment and discharges into the downstream channel. Its flow is about 5 gallons per minute. The dense growth of vegetation on the downstream face and at the toe made it difficult to determine whether any seepage actually exists. Further inspection can be made after all the vegetation is removed.

The dam appears to be founded on alluvial material covering the shale bedrock of the Brunswick formation. The dam is located on the northern edge of unglaciated Piedmont.

c. Appurtenant Structures

1. Spillway

The spillway consists of a reinforced concrete slab on grade, ogee weir, with an earth-fill core and a concrete vertical upstream face, 57 feet in length. The flow over the ogee was smooth, indicating that horizontal alignment is good. Any leakage through or around the spillway was not detectable, due to water flowing over the spillway. Erosion has taken place on the stone covered abutments. The left abutment is severely eroded and many of the stones have been pried loose by erosion, and by the thrust of a large tree's roots located on top of the embankment. On the right

abutment, erosion is less severe, but several blocks have fallen out near the toe and some cement rendering has been displaced along the intersection with the ogee.

The surface of the ogee is spalled and contains some transverse cracks. The concrete spillway apron also has some cracks and the right downstream corner is chipped off, exposing reinforcement.

Undermining of the toe is visible at the abutments. On the downstream face the deepened plunge pool has exposed the forward cut-off wall and gradual undermining could occur with time.

2. Low-level outlet

A 24 inch diameter concrete pipe outfall exists at the base of the right abutment. The inlet to the pipe is upstream of the dam and may be silted up. The sliding control gate is located on the upstream side of the right embankment, adjacent to the spillway. It is housed in a masonry wet well shaft with a wooden cover. The sliding gate's operating mechanism is missing, rendering the outlet inoperable. Because of the depth of water in the shaft, it could not be determined if the gate was still in the chamber. A small leakage was observed at the downstream end of the outlet pipe, but it was not possible to determine if blockage of the outlet pipe was due to the sliding gate or to silting up in the reservoir.

3. Mill-stream Outlet

The mill-stream intake is a masonry weir with its invert 6 inches below the elevation of the spillway crest. A steel sluice gate, measuring 3 feet in width and 4 feet six inches deep is in the closed position. The operating mechanism of the sluice gate has been removed, but water enters the mill-stream through a 12 inch by 6 inch orifice in the gate. The mill-stream was relatively clear of debris, and at the time of inspection, a flow of 3 cfs was estimated. The mill-stream divides about 300 yards downstream of the dam. Part of the stream flows by a small ditch directly back to the Passaic. The remainder flows into an underground chamber. The chamber leads to the abandoned mill, and discharges into the Passiac further downstream.

d. Reservoir Area

The rim of the reservoir is moderately sloped and covered with a heavy growth of trees and brush. No indication of instability was apparent. The only residential properties around the lake are above the right bank, on high ground. Sedimentation is visible along the rim of the lake, with widespread weed growth on the sediments.

e. Downstream Channel

The downstream channel winds through a flat valley. The stream banks are irregular, with some undermining. The right bank is grassed and the left bank is covered with dense tree growth. The stream bed is shallow and covered with sand and stones. No appreciable debris was seen. The channel flows under Route 202 within 1,000 feet, and passes a large restaurant, at low elevation, downstream of the road.

SECTION 4: OPERATIONAL PROCEDURES

4.1 Procedures

Van Dorans Mill Dam now only serves to impound water for private recreational activities, and esthetic reasons. The level of the lake is maintained by unregulated discharge over the spillway.

The lake is not lowered at any time because the low-level outlet is inoperable, and the policy is to maintain the lake level as nearly constant as possible, close to the elevation of the spillway crest. The owners operate and control the millstream.

4.2 Maintenance of the Dam

There is no program of regular inspection and maintenance of the dam and appurtenant structures, although the owners are responsible for these functions.

In 1972, the owner was notified by NJDEP that the reservoir would have to be drained if a program of dam maintenance and silt removal was not performed within a few months. The owner requested an extension of time so that he could obtain the necessary technical assistance to perform the required maintenance. The records contain copies of the correspondence between the owner, NJDEP, and a consulting engineer, but after June 12, 1973, no further action was recorded. The matter seems to have been dropped by all those concerned.

4.3 Maintenance of Operating Facilities

The operating facilities consist of a defunct low-level outlet with a manually operated slide-gate, and a weir for the mill stream with a manually operated sluice gate. The mechanical device for lifting the latter gate has been removed.

No recent maintenance is known to have taken place on either facility, with the exception of the mill stream, which is kept clean and free flowing.

4.4 Evaluation

The present lack of any procedures for inspecting and maintaining the dam and operating facilities is an indication of negligence and is not conducive to safe operation of the dam. The possible loss of lives and important property less than 1/4 mile downstream, in the event of a dam or spillway failure, makes it imperative that if the continued existence of the dam and reservoir is desired, a formalized program of maintenance and repairs be performed within the next six months.

SECTION 5: HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

The drainage area above Van Dorans Mill Dam is approximately 8.8 square miles. A drainage map of the watershed is presented on Plate 1, Appendix D.

The topography within the basin is moderate to steep. Elevations range from about 860 feet above MSL at the south-west end of the watershed to about 250 feet above MSL at the dam site. Land use patterns within the watershed are mostly wooded, with about 25 percent urban, scattered throughout the basin.

The evaluation of the hydraulic and hydrologic features of Van Dorans Mill lake was based on criteria set forth in the Corps Guidelines and additional guidance provided by the Philadelphia District, Corps of Engineers. The Spillway Design Flood for the dam falls in a range of 1/2 PMF to PMF. In this case the low end of the range, 1/2 PMF, was chosen, since the factors used to select size and hazard classification are on the low side of their respective ranges.

The probable maximum flood (PMF) was calculated from the probable maximum precipitation using Hydrometeorological Report No. 33 with standard reduction factors. Due to the small drainage area, the SCS triangular hydrograph transformed into a curvilinear hydrograph was adopted for developing the unit hydrograph, with the aid of the HEC1-DB Flood Hydrograph Computer Program.

Initial and infiltration loss rates, were applied to the probable maximum precipitation to obtain rainfall excesses. The rainfall excesses were applied to the unit hydrograph to obtain the various ratios of PMF utilizing the HEC1-DB program.

The SDF peak outflow calculated for Van Dorans Mill Dam is 11,934 cfs. This value is derived from the 1/2 PMF and results in overtopping of the dam.

The stage-outflow relation for the spillway was determined manually from the known spillway length, elevation, and assumed discharge coefficients, and is shown in the Hydrologic Computation (Appendix D).

The reservoir storage capacity curve was computed directly by the conic method, utilizing the HEC1-DB program. The conic method assumes that the reservoir capacity resembles a series of vertically stacked cones. The reservoir surface areas at various elevations were measured from topographic maps with a planimeter. Reservoir storage capacity included surcharge levels exceeding the top of the dam, and the spillway rating curve was based on the assumption that the dam remains intact during

routing. A breach analysis indicates that the hazard potential for loss of life downstream, due to dam failure from overtopping, is not greater than that which exists without failure, and thus the spillway is rated as "inadequate."

Draw-down calculations indicate that to empty the lake to an elevation of 252.13' MSL through the low-level outlet would take 55 days and 19 hours, assuming a 2 cfs/square mile in-flow. This time-frame is inadequate for emergency drawdown and provision of additional low-level outlet facilities should be considered.

b. Experience Data

No records of reservoir stage or spillway discharge are maintained for this site. However, it is known that the dam was overtopped following failure of an upstream dam during a hurricane in 1940. However, the damage at the downstream reach is not recorded and could not be ascertained.

c. Visual Observation

The valley below the dam is flat, and widens into a swamp about one mile downstream. Within 1/8 of a mile downstream are a house, restaurant, motel, and U.S. Route 202. One quarter of a mile downstream, is Interstate Route 287. The presence of these buildings and major highways confirms the "high" hazard potential of the dam. Siltation in the lake has greatly reduced its original capacity. The slopes around the lake are mild, and covered with grass and trees, and do not appear unstable.

d. Overtopping Potential

A storm of magnitude equivalent to the SDF would cause overtopping of the dam to a height of 3.16 feet. Computations indicate that the dam can pass approximately 5 percent of the PMF without overtopping the dam crest. Since one half the PMF is the minimum Spillway Design Flood (SDF) for this dam, according to the Recommended Guidelines for Safety Inspection of Dams by the Corps of Engineers, the spillway capacity of Van Dorans Mill Dam is assessed "inadequate."

SECTION 6: STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations

The visual observations made during the inspection give rise to concern about the stability of the eroded spillway abutments. They also caused some concern about the stability of the embankment and the spillway.

The left spillway abutment is more severely eroded than the right spillway abutment. The downstream face of the embankment has many deep animal burrows and some seepage seems to be occurring through the embankment. Undermining of the spillway toe also presents a potential hazard.

b. Design and Construction Data

No design computations relating to stability were uncovered during the report preparation phase. No embankment or foundation soil parameters are available for carrying out a conventional stability analysis on the embankment. No construction data or specifications relating to the degree of embankment compaction are available for use in the stability analysis. The cross-sections shown on the drawing need to be validated to be meaningful for a stability analysis.

c. Operating Records

No operating records are available relating to the stability of the dam. The dam and spillway have served satisfactorily since the rehabilitation of 1942.

d. Post-Construction Changes

No post construction changes have been performed since the dam was rehabilitated and the present spillway constructed in 1942. The embankment was extended on the left abutment, to replace the old spillway at that time.

e. Static Stability

A static stability analysis was not performed for Van Dorans Mill Dam because the lack of data on which to base assumptions of material properties and embankment cross-sections might produce misleading results. The recommended remedial actions must be implemented in order to decrease the risk of local failure, and until further studies and analyses are made, the static stability must be considered questionable.

f. Seismic Stability

The dam is located in Seismic Zone 1, as defined in Recommended Guidelines for Safety Inspection of Dams, as prepared by the Corps of Engineers. In general, projects located in Seismic Zone 0, 1 and 2 may be assumed to present no hazard from earthquakes, provided the static stability conditions are satisfactory and conventional safety margins exist. In this case, the static stability is questionable and thus the seismic stability is not assured. A Geologic Map of the area is presented on Plate 2.

SECTION 7: ASSESSMENT/REMEDIAL MEASURES

7.1 Dam Assessment

a. Safety

The dam has been inspected visually and a review has been made of the available engineering data. This assessment is subject to the limitations inherent in the visual inspection procedures stipulated by the Corps of Engineers for a Phase I report.

The safety of Van Dorans Mill Dam is in question because the dam does not have adequate spillway capacity to pass 1/2 PMF without overtopping. Overtopping of the dam carries with it the danger of possible progressive failure of the dam or spillway. The dam's present spillway capacity can pass only about 5 percent of the PMF.

No definitive statement pertaining to the safety of the embankment can be made without acquisition of embankment and foundation material engineering properties and determination of phreatic levels in the downstream part of the embankment. The possibility of failure may exist particularly in the event of overtopping or seismic excitation, since the present condition of the spillway structure, its abutments and the earth embankment may not be satisfactory and may not have an adequate safety margin. This can only be confirmed by further investigation.

b. Adequacy of Information

The information uncovered was adequate to perform hydrologic and hydraulic computations, although the depth of the lake is not known. The data was insufficient to perform even an approximate computation of the dam's stability. An assessment of the dam could be made by visual observation only.

c. Urgency

All recommended studies should be performed by an engineer qualified in the design and construction of dams.

- A more precise hydrologic and hydraulic analysis of the dam should be conducted within six months, to determine the need and type of mitigating measures necessary. If required, conduct a study of the means of increasing spillway discharge capacity and develop alternative schemes for construction. This should include the installation of headwater and tailwater gages, and determination of the ability of the dam to withstand overtopping.

- Observation wells or piezometers should be installed within six months on the downstream embankment face to determine the location of the phreatic surface at periodic intervals.

- Samples should be taken to determine the pertinent soil parameters required for a stability analysis of the embankment and spillway. The borings should be logged according to the Unified Soil Classification System by qualified personnel. This information should be obtained within six months and should be evaluated immediately upon acquisition to perform stability analyses in conformance with Chapter 4.4 of the Corps Guidelines

- The existing drawing of the dam should be annotated and updated within three months.

7.2 Remedial Measures

a. Alternatives for Increasing Spillway Capacity

The spillway capacity may be increased with any of the following alternatives.

1. Increase the dam height, thus permitting a higher discharge to pass over the spillway and reducing the possibility of overtopping.

2. Lower the spillway crest elevation.

3. Widen the spillway structure.

4. A combination of any of the above alternatives.

b. Other Remedial Measures

1. A safe means of lowering the lake should be provided. This would involve restoring the existing outlet pipe to operable condition. This work should be performed within six months.

2. Provide concrete underpinning at the toe of the spillway abutments. In the right abutment, replace missing stones with concrete and repoint existing stones. Rebuild the left abutment. This work is to be undertaken within six months.

3. Repair the concrete surface and apron of the spillway structure, using epoxy concrete and reinforcing where required.

4. Remove all trees and brush from the embankments and abutments to avoid problems which may develop from their roots. The entire downstream face should then be inspected for cracks and unusual settlements or loss of fill material and the extent of animal burrowing determined. The downstream face should then be repaired where required, and the animal burrows filled. Add rip-rap protection to the upstream face. This work should be undertaken within six months.

c. Recommendations

The following actions are recommended:

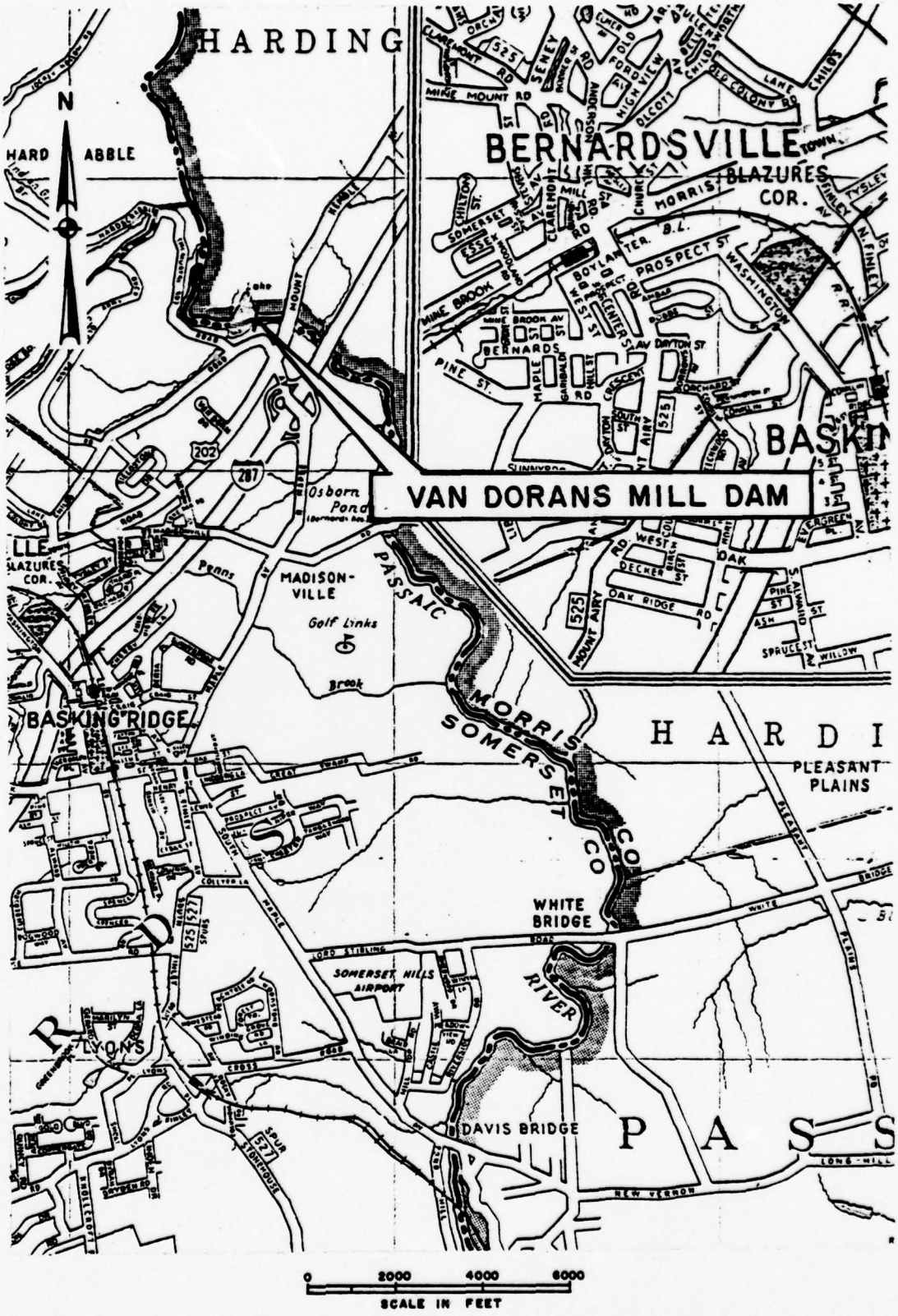
1. Establish a flood-warning system for the downstream community within three months.

2. Consider providing additional low-level outlet facilities.

d. Operation and Maintenance Procedures

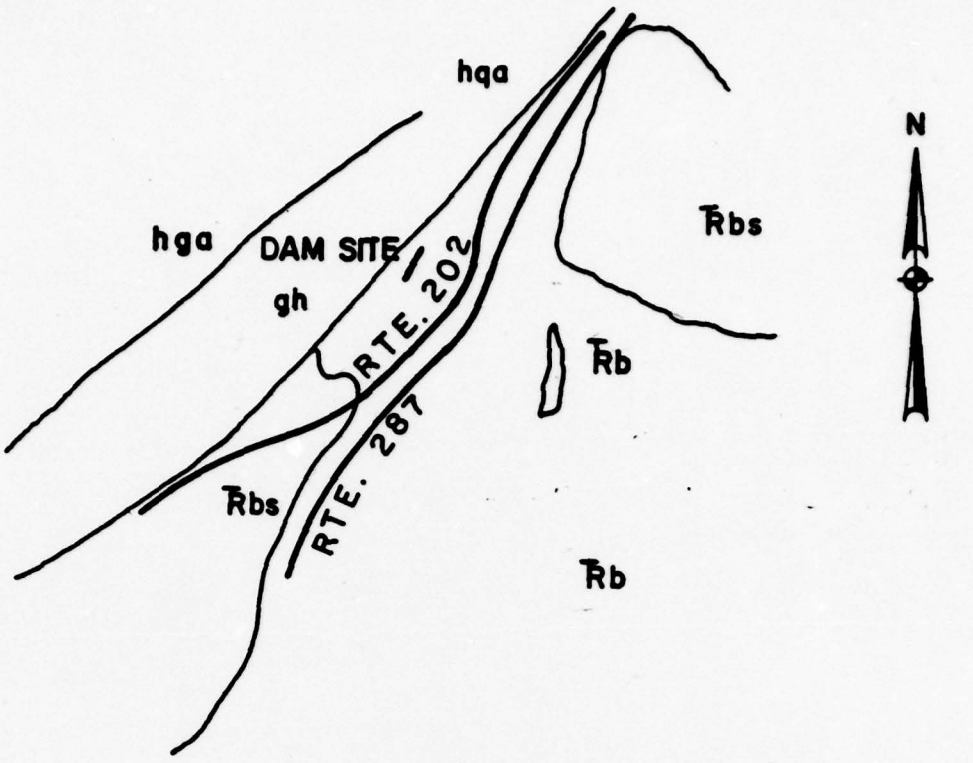
A formalized program of annual inspections of the dam by an experienced party should be initiated, utilizing the standard visual check list in this report. Headwater and tailwater gages should be installed in the dam and read during and after severe rain storms and during routine operating and maintenance visits to the dam. A permanent log should be kept of all maintenance and operating events of the dam and the lake. Possible movement of the dam should be monitored regularly by means of surveying monuments. Any increase in seepage flow should also be carefully monitored and investigated.

PLATES



VICINITY MAP

PLATE I



LEGEND

PRECAMBRIAN

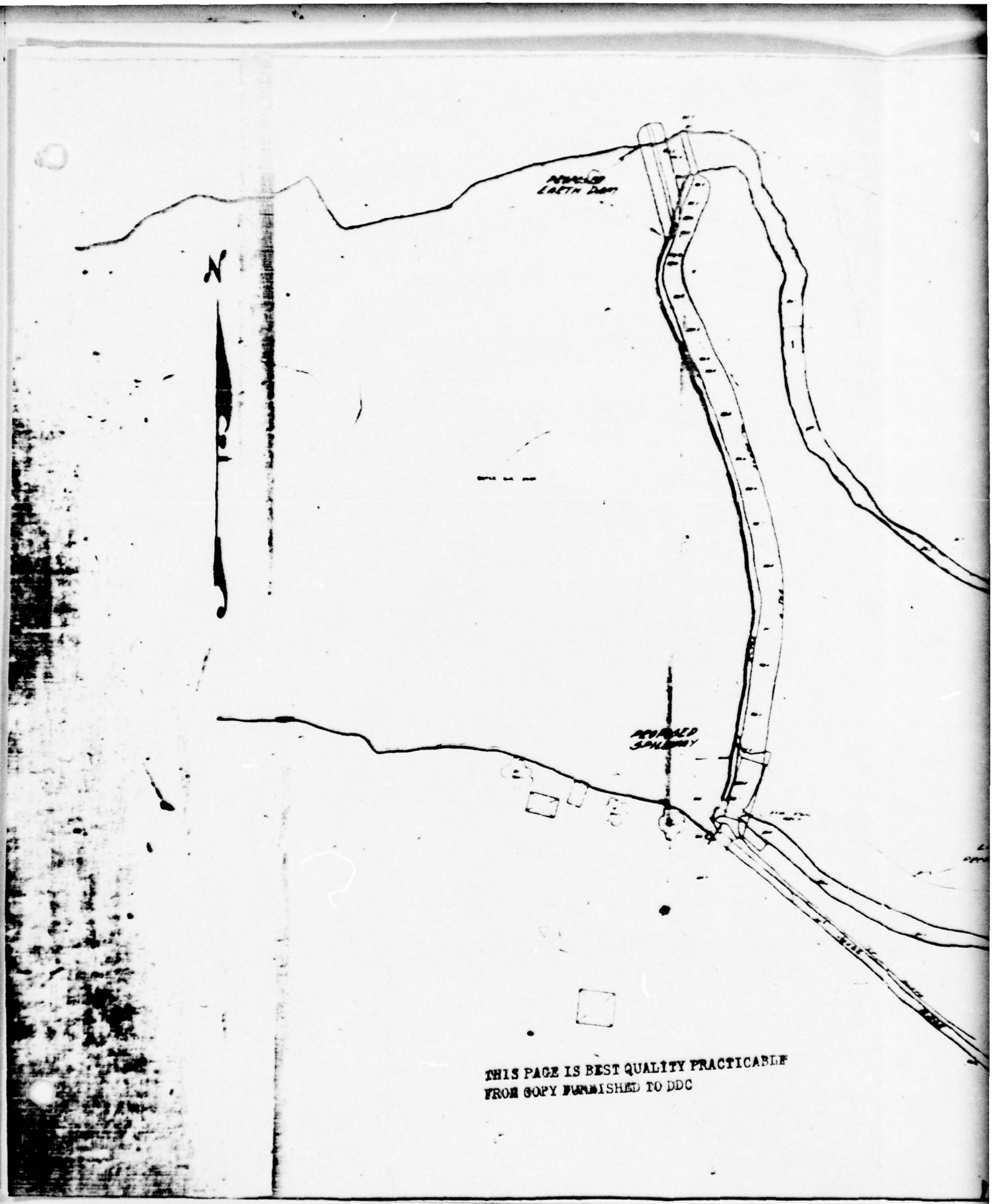
gh	Hornblende Granite & Gneiss .
hga	Hypersthene - Quartz Andesine .

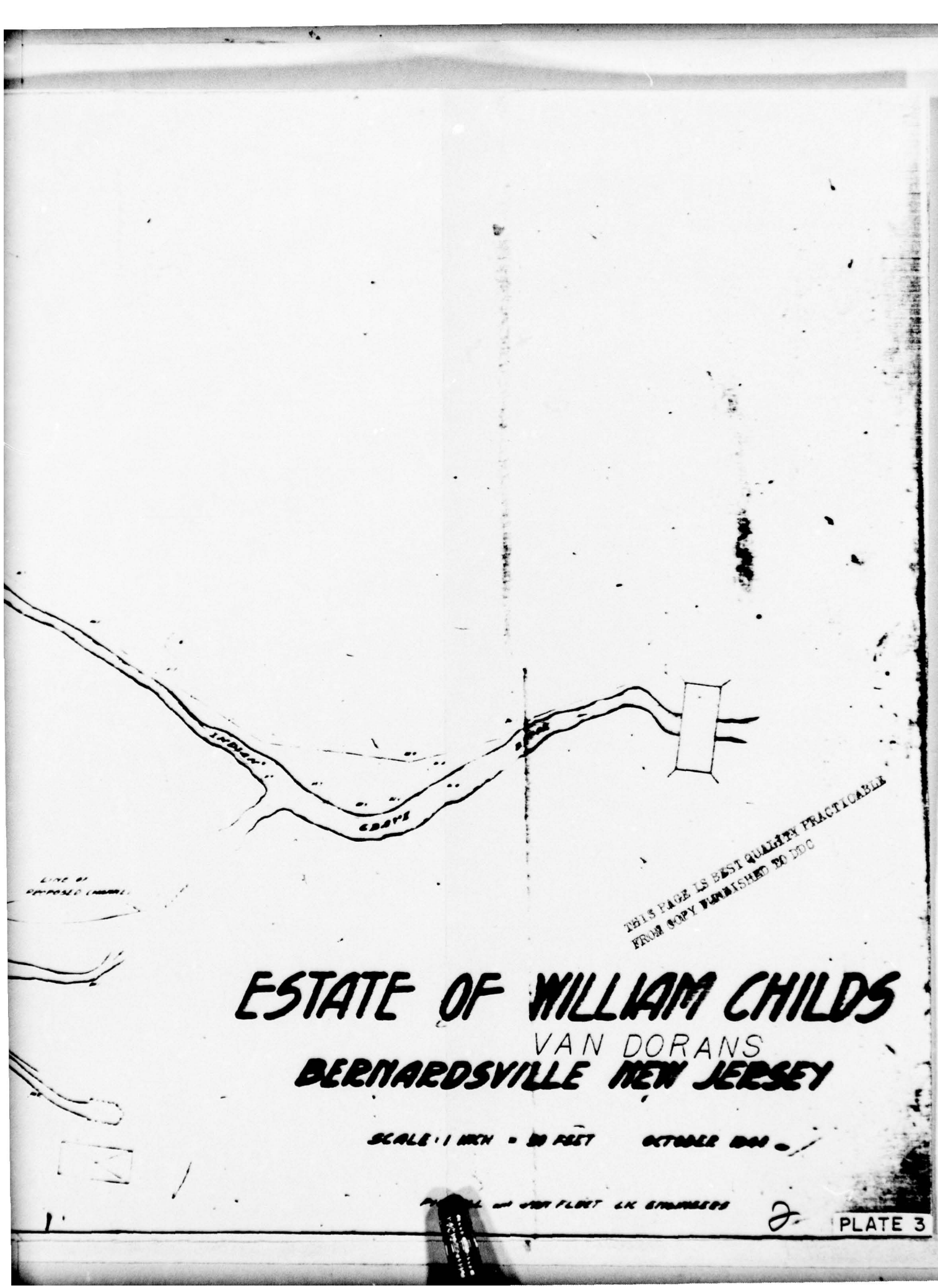
TRIASSIC

Rbs	Basalt Flows
Rb	Brunswick Formation .
Rc	Border Conglomerate .
—	Contact

GEOLOGIC MAP
VAN DORANS MILL

PLATE 2





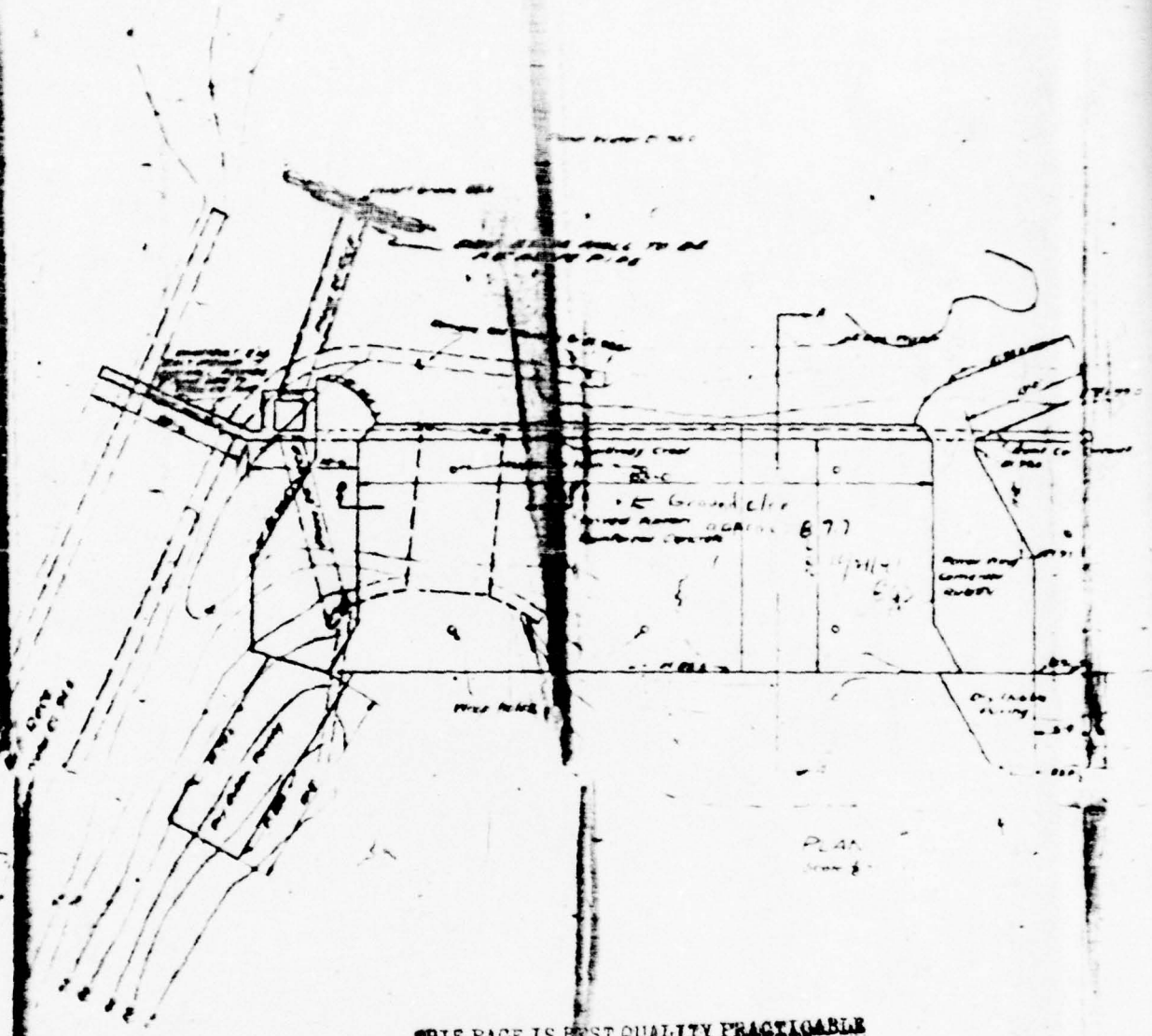
ESTATE OF WILLIAM CHILDS

VAN DORANS

BERNARDSVILLE NEW JERSEY

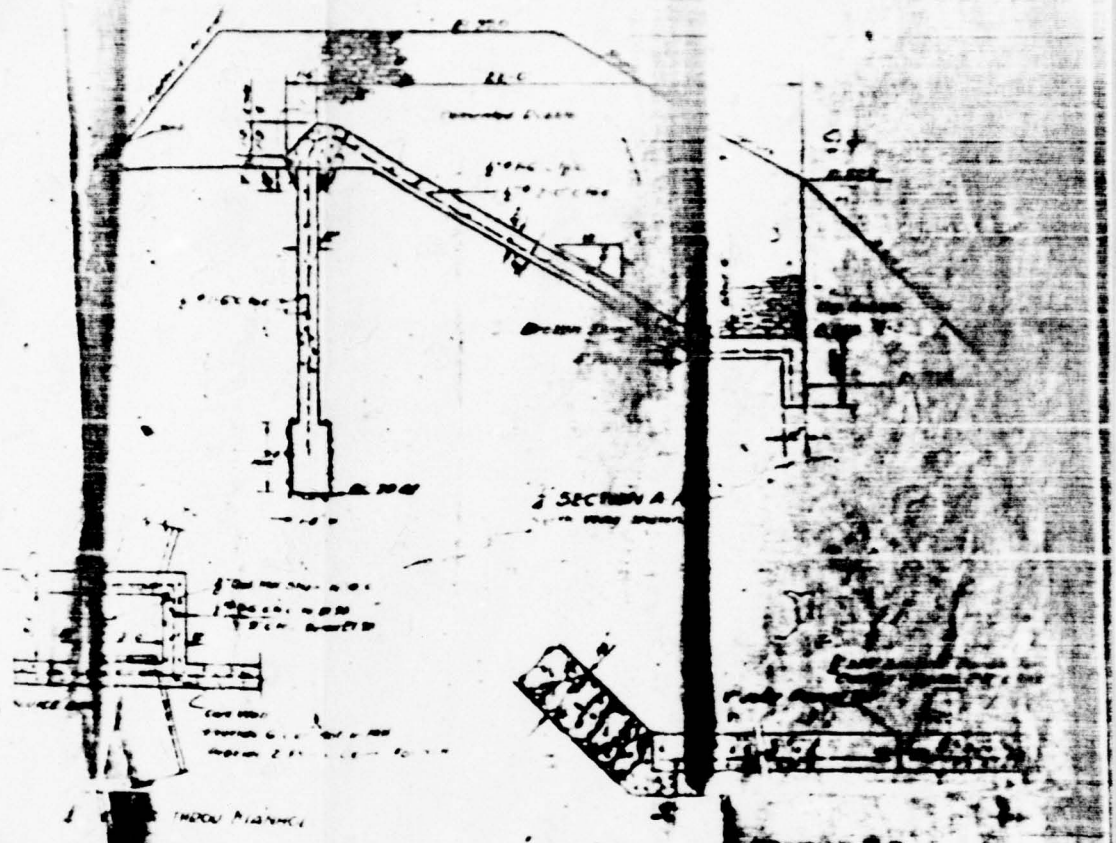
SCALE: 1 INCH = 50 FEET OCTOBER 1941

PLATE 3



PLAN

ELEVATION



POOR MAP

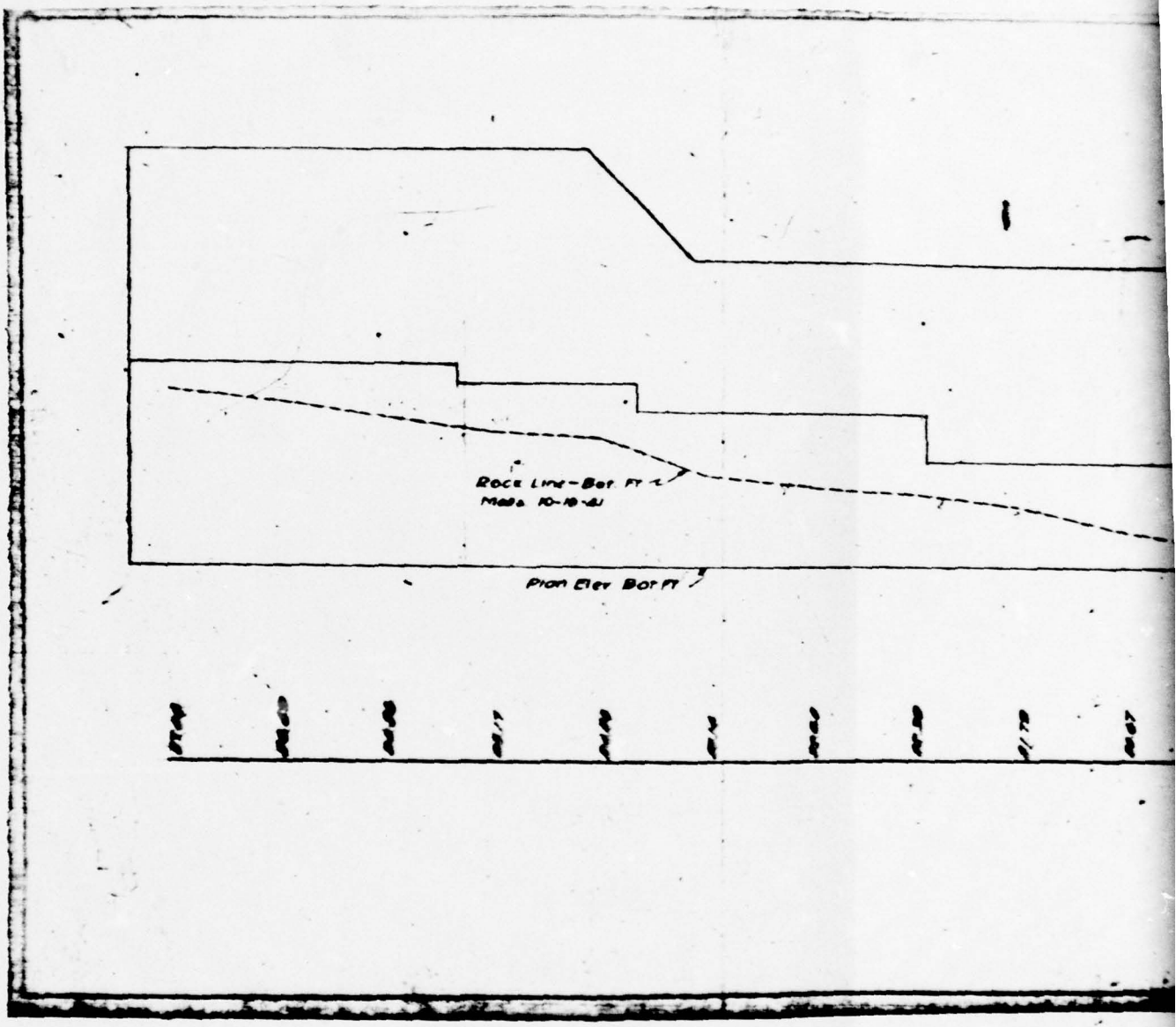
PLAN OF

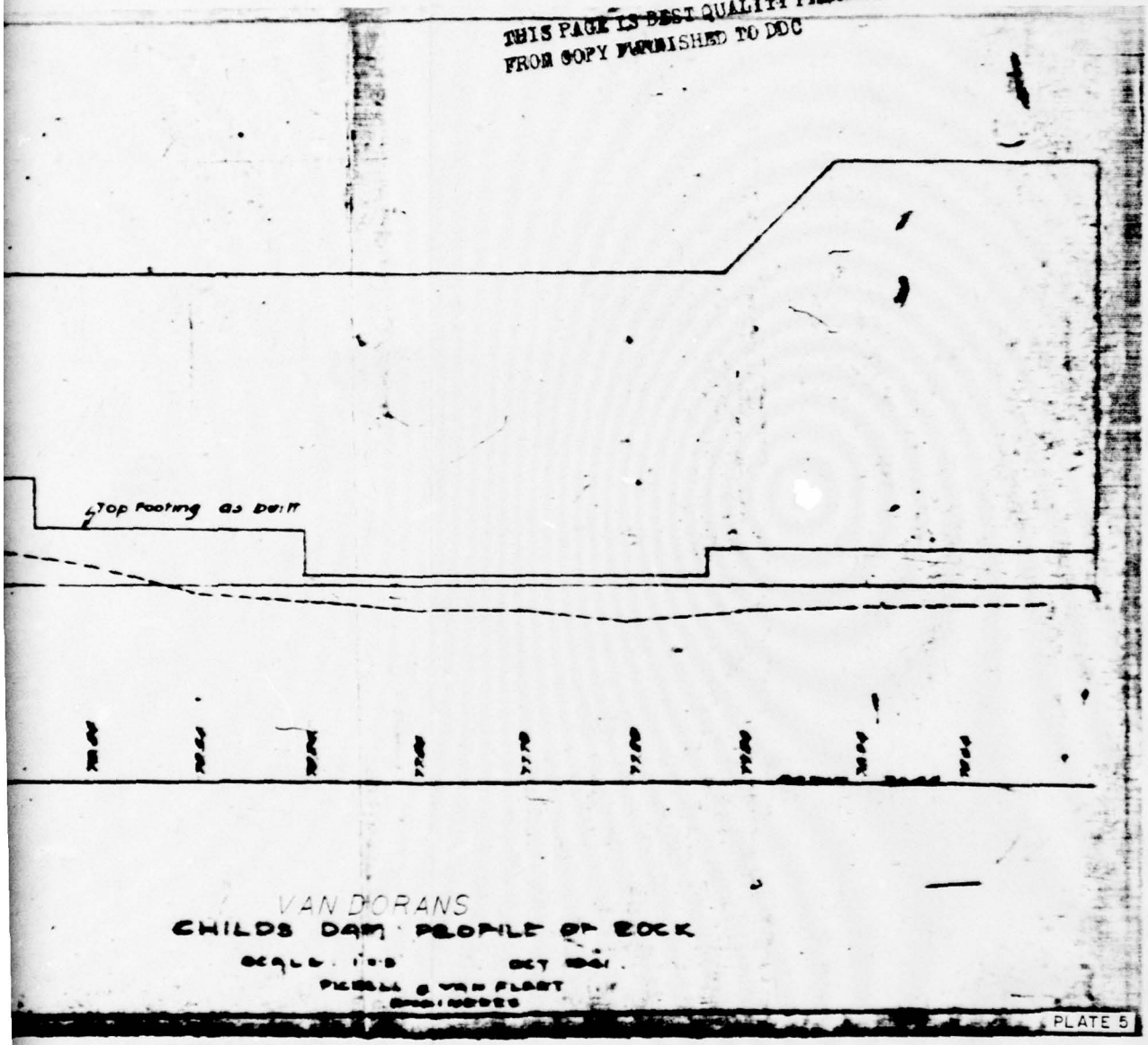
EST. OF WILL

SCALE: AS INDICATED

VAN DORANS

PLATE 4





VAN DORANS

CHILDS DAM PROFILE OF ROCK

SCALE: 1"=5' OCT 1941

PICKELL & VAN FLEET
ENGINEERS

PLATE 5

APPENDIX A

CHECK LIST - VISUAL OBSERVATIONS

CHECK LIST - ENGINEERING, CONSTRUCTION, MAINTENANCE DATA

CHECK LIST
VISUAL INSPECTION

PHASE I

Name of Dam Van Dorans Mill County Somerset State New Jersey Coordinators NJDEP

Date(s) Inspection May 4, 1979 Weather Partly Cloudy Temperature 60°F

Pool elevation at Time of Inspection 252.2' M.S.L. Tailwater at time of Inspection 240.5' M.S.L.

Inspection Personnel:

R. Ernest-Jones
E. Koo
H. King
C. Chin

Owner/Representative:

None attended.

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS AND RECOMMENDATIONS
SURFACE CRACKS	Heavy brush and trees prevented a full visual inspection for cracks. No cracks noted within 100' to left of dam.	The d/s face should be inspected after the removal of all trees and heavy brush. All surface repairs should be made with quarry run stone.
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed.	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Many deeply burrowed holes were observed along left embankment, ranging from a few inches to more than a foot in diameter.	Burrows should be covered with quarry run stone after removal of trees and brush.
VERTICAL & HORIZONTAL ALIGNMENT OF THE CREST	Embankment alignment is irregular, and original alignment was not available for comparison.	A survey of present alignment should be made, to monitor possible movements in the future.
RIPRAP FAILURES	No rip rap protection was provided on the upstream faces. Some loose rip-rap was visible on the d/s face at the left end, where an extension of the embankment was made in 1941 to replace the old spillway. Rip-rap protection on each side of the spillway was loose and parts were missing.	Rip-rap protection should be added on u/s face.

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS AND RECOMMENDATIONS
VEGETATION	The left embankment was covered with a dense growth of brush and trees. Large trees growing on each side of the spillway are endangering the stability of the rip-rap shoulders.	Remove all brush and trees from embankment.
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Severe erosion in the rip-rap covered abutments of the concrete spillway, where it joins the left and right embankments. The left embankment is near ruin. A large tree is growing on each abutment.	Repair and patch abutments with stone and mortar.
ANY NOTICEABLE SEEPAGE	Stagnant water found in two locations at the toe of the left embankment. Heavy vegetation on d/s face made exact detection of seepage difficult, but a constant seepage flow of approximately 5 gpm was noted in a ditch parallel to the toe.	Inspect for possible seepage after removal of trees and brush.
STAFF GAGE AND RECORDER	None.	
DRAINS	None.	

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS AND RECOMMENDATIONS
CONCRETE WEIR		
	Concrete ogee with 57 foot long crest. Moderate spalling and cracking were observed on spillway surface and apron. The tip of the right downstream corner of the spillway apron has broken off. Washing out of material in the plunge pool has undermined the downstream edges and sides of the spillway apron.	Patch concrete surfaces and repair concrete apron. Add heavy stones along d/s edge and sides of apron.
APPROACH CHANNEL		
	None.	
DISCHARGE CHANNEL		
	Immediately below the spillway, the plunge pool is deep and is followed by a natural channel with eroded banks.	
BRIDGE AND PIERS		
	The small footbridge over the mill-stream is badly deteriorated.	Renew timbers as necessary.

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS AND RECOMMENDATIONS
CRACKING & SPALLING OF CONCRETE SURFACES IN STILLING BASIN	N/A	
INTAKE STRUCTURE	1. Mill stream: Concrete wall in good condition with cast iron sluice gate. sluice gate is in closed position and the operating gear is inoperable. Small opening cut at bottom of sluice gate provides passage of water into mill stream. 2. Low-level Outlet: 24 inch concrete pipe with intake end in reservoir floor was not inspected.	1. No action. 2. Inspect for silt blockage and clean out if required.
OUTLET STRUCTURE	1. Mill stream: Outlet structure at some distance downstream of dam, (approx. 400 feet). Some of the flow returns to the downstream channel via a ditch. 2. Low-level Outlet: 24 inch concrete pipe ends at toe of right abutment. A small amount of leakage was detected.	
OUTLET FACILITIES	1. Mill stream gate: is not readily operable. 2. Low-level Outlet: 24 inch pipe has a cast-iron slide gate in a wet well shaft made of reinforced concrete, located at the upstream face of the embankment; 10 feet to the right of the spillway. The gate mechanism is corroded and inoperable.	1. Millstream is cleaned and kept open by local residents. 2. Restore gate operating mechanism and clean out gate chamber is required.
EMERGENCY GATE	None.	

INSTRUMENTATION

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS AND RECOMMENDATIONS
MONUMENTATION/SURVEYS		
None.		Install a benchmark nearby.
OBSERVATION WELLS		
None.		
WEIRS		
None.		
PIEZOMETERS		
None.		
OTHERS		
None.		Install headwater and tailwater gages.

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS AND RECOMMENDATIONS
SLOPES	The slopes around the reservoir are moderate to flat, and they are heavily wooded with deciduous trees and brush. The land along the lake front is undeveloped, but residential properties occupy the areas further away from the lake rim.	
SEDIMENTATION	In 1972, the present owner applied for a permit to dredge the lake for recreational use because sedimentation had made the lake very shallow. There is no record that any dredging was actually performed.	The present inspection did not include any soundings. However, extensive silting was not visually apparent near the dam, but in the reservoir, extensive weed growth indicated bank siltation.
USE	Recreational only.	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS AND RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Below the spillway apron, the plunge pool appeared to be deep (no soundings were made). The downstream channel, Passaic River, is a shallow meandering stream with eroded banks. No debris was found.	
SLOPES	The slopes are flat to mild, with heavy growth of trees and brush on the left bank, and grass on the right bank.	
APPROXIMATE NUMBER OF HOMES AND POPULATION	Before Route 202, there is a house on the right bank. Past the road, there is a restaurant and motel in the flood path.	Confirms "high" hazard rating.
OTHER PROPERTIES	U.S. Route 202 and Interstate Route 287 cross the Passaic River about 1/8 and 1/4 mile downstream, respectively.	

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

ITEM	REMARKS
PLAN OF DAM	Two of three drawings available at NJDEP, are included.
REGIONAL VICINITY MAP	U.S.G.S. Bernardsville Quadrangle.
CONSTRUCTION HISTORY	Construction of spillway and extension of left embankment. Available at NJDEP.
TYPICAL SECTIONS OF DAM	One of three drawings available at NJDEP, are included.
HYDROLOGIC/HYDRAULIC DATA	None available.
OUTLETS - PLAN	Two of three drawings available at NJDEP, are included.
- DETAILS	Two of three drawings available at NJDEP, are included.
- CONSTRAINTS	None available.
- DISCHARGE RATINGS	None available.
RAINFALL/RESERVOIR RECORDS	None available.

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
(continued)

ITEM	REMARKS
DESIGN REPORTS	None available.
GEOLOGY REPORTS	None available.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	Analysis of flow over spillway, available from NJDEP.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	None available.
POST-CONSTRUCTION SURVEYS OF DAM	Inspection reports following construction in 1941, available from NJDEP.
BORROW SOURCES	Not known.
SPILLWAY PLAN - SECTIONS	Two of three drawings available from NJDEP, are included.
- DETAILS	Two of three drawings available from NJDEP, are included.

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
(continued)

ITEM	REMARKS
OPERATING EQUIPMENT PLANS AND DETAILS	None available.
MONITORING SYSTEMS	None available.
MODIFICATIONS	Spillway in 1941. Available from NJDEP.
HIGH POOL RECORDS	None available.
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None available.
PRIOR ACCIDENTS OF FAILURE OF DAM - DESCRIPTION - REPORTS	Overtopping occurred in 1940 followed by breaching at two locations, due to Hurricane Doria. Available at NJDEP.
MAINTENANCE OPERATION RECORDS	None available.

APPENDIX B

PHOTOGRAPHS

(Taken on May 4, 1979)

Photo No. 1 - Overall view of spillway from downstream. Note the large trees growing above the rip-rap on both sides of spillway, and the overgrown left embankment.

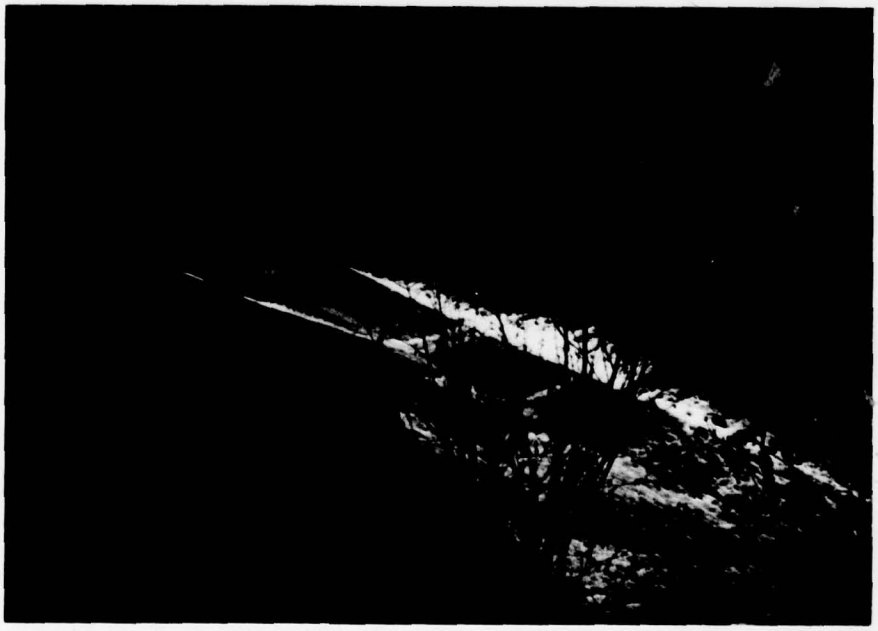


Photo No. 2 - View of spillway ogee from right bank. Note the smooth flow over the crest and the minor surface turbulence on the face.

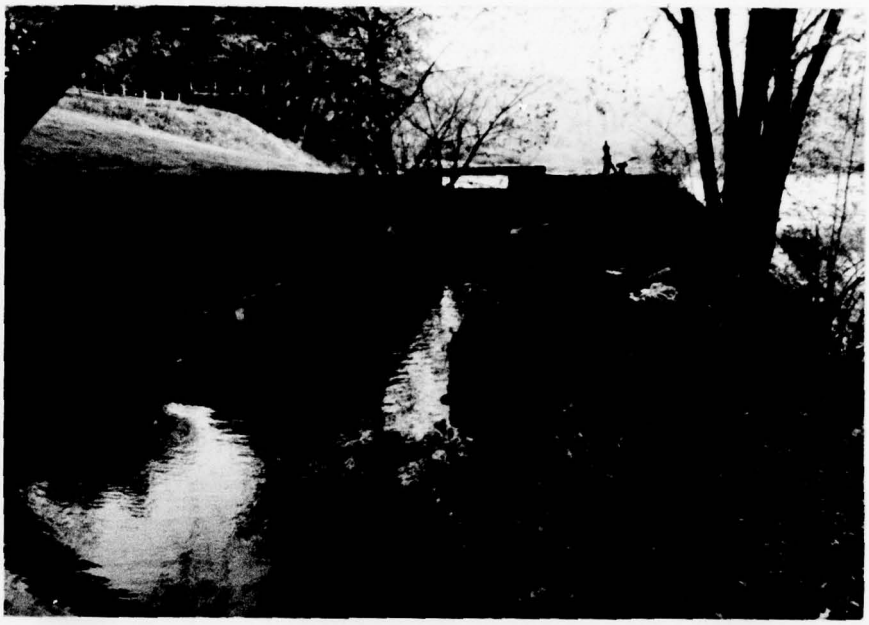


Photo No. 3 - View of mill-stream to the right of the spillway. The picture shows the control sluice and the footbridge.

Photo No. 4 - Downstream view of mill-stream showing artificial embankment.

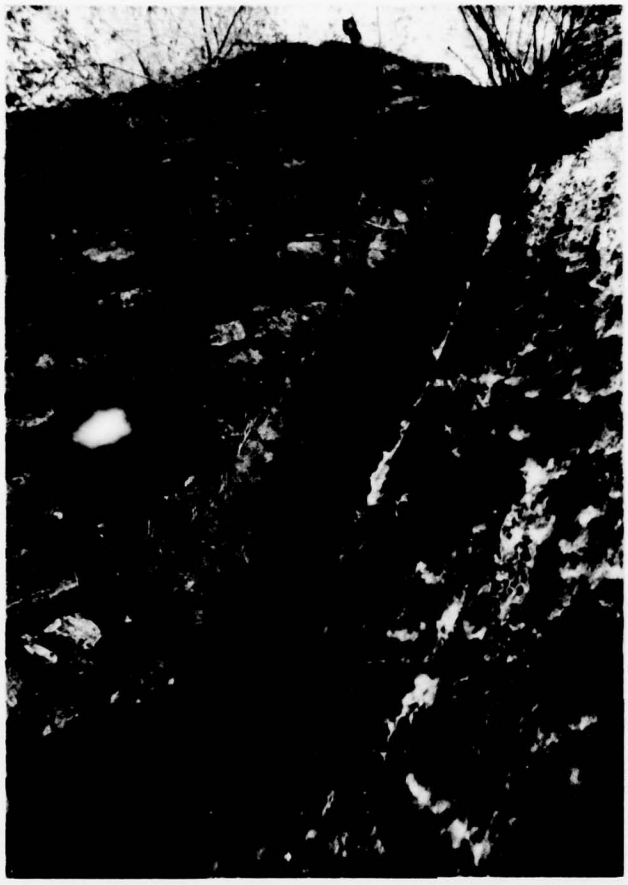


Photo No. 5 - Detail of deteriorated rip-rap at right end of spillway.

Photo No. 6 - Detail of deteriorated rip-rap at left end of spillway. Note the dangerous condition of the tree.

Photo No. 7 - Detail of low-level outlet discharge. Note the minor leakage, and the missing blocks of rip-rap around the pipe.

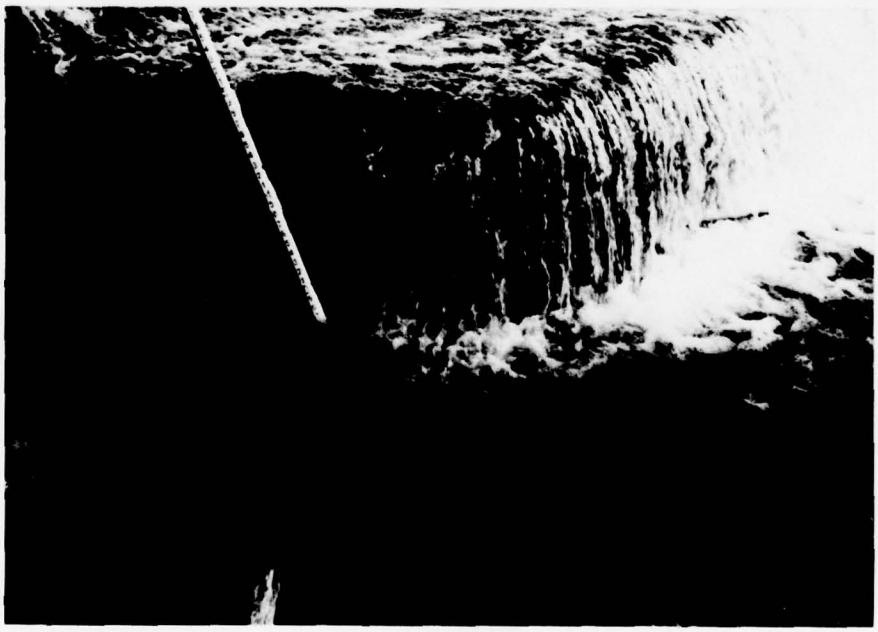


Photo No. 8 - Detail of broken section of concrete at right toe of spillway.

Photo No. 9 - Detail showing a typical animal burrow in the downstream face.

Photo No. 10 - View of seepage at the toe of the left downstream embankment face.

Photo No. 11 - View of the reservoir looking upstream from the foot-bridge. Note the moderate slopes and weed growth around rim. The well containing the control valve for the low-level outlet can be seen in the foreground.

Photo No. 12 - View of downstream channel - Passaic River. Note the densely wooded, flat area on the left bank and the grassed right bank.

APPENDIX C

SUMMARY OF ENGINEERING DATA

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

Name of Dam: Van Dorans Mill Dam

Drainage Area Characteristics: Meadows and lightly wooded, mild slope.

Elevation Top Normal Pool (recreation pool): 252.13' MSL (30 acre-feet)

Elevation Top Flood Control Pool (Storage Capacity): N/A

Elevation Maximum Design Pool: (S.D.F.) 258.16' MSL (94 acre-feet)

Elevation Top Dam: 255' MSL (55 acre-feet)

SPILLWAY CREST

a. Elevation 252.13' MSL

b. Type Dropped concrete ogee.

c. Width 3'

d. Length 57'

e. Location Spillover Full length.

f. No. and Type of Gates None.

OUTLET WORK

a. Type Millstream, controlled by steel gate.

b. Location On right bank, running dowsntream.

c. Entrance Inverts 251' MSL (est.)

d. Exit Inverts 250.5' MSL (est.) (300 feet downstream)

e. Emergency Draindown Facilities 24" ø low-level outlet. (slide gate)

HYDROMETEOROLOGICAL GAGES

a. Type N/A

b. Location N/A

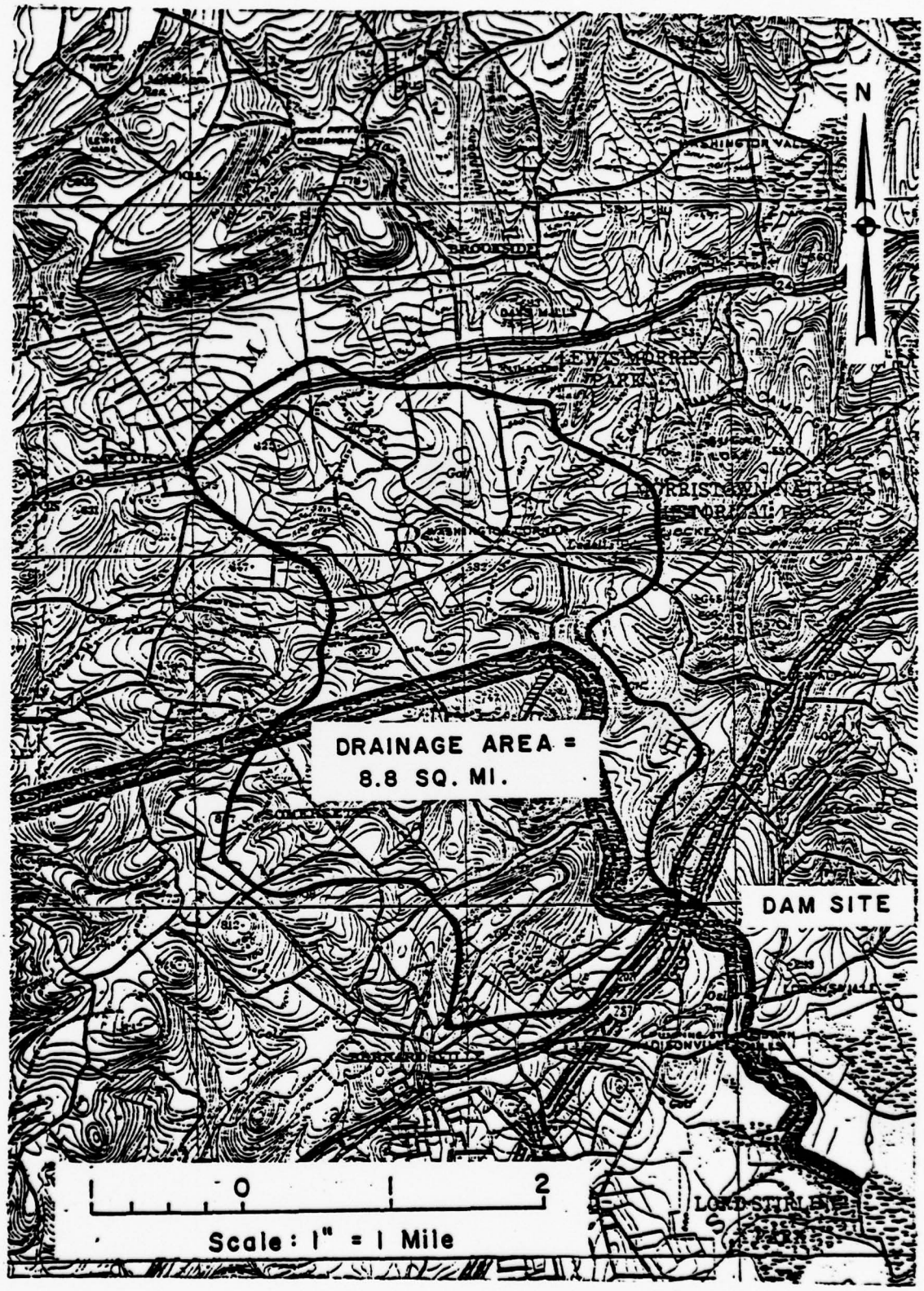
c. Records N/A

MAXIMUM NON-DAMAGING DISCHARGE 1121 cfs

APPENDIX D

HYDROLOGIC COMPUTATIONS

PLATE I APPENDIX D



VAN DORANS MILL DAM
DRAINAGE BASIN

FREDERIC R. HARRIS, INC.
CONSULTING ENGINEERS

SUBJECT N.Y. DAM INSPECTION
VAN DORAL MILL DAM
COMPUTED BY J. ZAFONTE CHECKED BY
SHEET NO. 1 OF
JOB NO. 10-A20-01
DATE 23 JULY 1979

SIZE CLASSIFICATION

a) SURFACE AREA OF MAIN IMPOUNDMENT (at spill) 6.94 ACRES
b) STRUCTURAL HGT OF DAM 14.7 FT
c) SIZE CLASSIFICATION SMALL

HAZARD POTENTIAL CLASSIFICATION

HAZARD POTENTIAL CLASSIFICATION HIGH
RECOMMENDED SPF ½ PMF TO PMF
Lower side of ½ PMF considered

HYDROLOGIC ANALYSES

USE THE HEC-1 DAM SAFETY INVESTIGATION PACKAGE. ROUTE THE FLOOD USING THE SCS TRIANGULAR UNIT HYDROGRAPH WITH CURVILINEAR TRANSFORMATION

DRAINAGE AREA = 8.8 SQ. MI.

PRECIPITATION

USING "HMS - REPORT NO 33", FIG 1 PROBABLE MAXIMUM PRECIPITATION FOR 200 mi² - 24 HR [THE ALL SEASONS ENVELOPE]:

PMP = 23 in. (for ZONE 6)

SINCE THE D.A = 8.8 mi² & HMS-33 REDUCES THE PMP TO A D.A. of 10 mi² THIS IS USED AS THE MINIMUM

DURATION IN HR.	% of PMP (10 SQ mi)
6	114
12	124
24	133
48	143

INFILTRATION DATA

USING - "ENGINEERING SOIL SURVEY of NEW JERSEY" by RUTGERS UNIVERSITY JANUARY 1953

SOIL CLASSIFICATION -	MMg C - 46	CHESTER	B
	GMC - 46	WASHINGTON	B

∴ USE HYDROLOGIC SOIL GROUP B USE CN = 60

LAND USE (FROM USGS QUADS) 1/4 URBAN, 3/4 WOODLAND

USE AN INITIAL INFILTRATION OF = .2 S = 1.33 IN
AND CONSTANT INFILTRATION RATE OF .07 IN/HR
(SCS HYDROLOGY HANDBOOK FIG 10.1)

FREDERIC R. HARRIS, INC.
CONSULTING ENGINEERS

SUBJECT N. J. Dam Inspection SHEET NO. 3 OF
Van Dorans Mill Dam JOB NO. 10-A 70-07
COMPUTED BY JEZ CHECKED BY DATE July, 1979

Time of Concentration, T_c

1. Estimating T_c from velocity estimate and water course length (Ref SCS Hydrology Handbook

Overland Flow $620-500/5,500$ .375 fps

Channel Reach $500-250/24,000$ 1.5 fps

$$T_c = \left[\frac{5,500}{.375} + \frac{24,000}{1.5} \right] \frac{1}{3600} = 8.52 \text{ HR}$$

2.) Estimating T_c from Vel. & length assuming $Vel_{CH} = Vel_{OB}$

$$T_c = \frac{29,500}{1.5} \cdot \frac{1}{3600} = 5.46 \text{ HR}$$

3.) Estimating T_c from the nomograph in "Design of Small Dams" - U.S.D.I. Pg 47

$$T_c = \left(\frac{11.9 \, L^3}{H} \right)^{.385} = 1.94 \text{ HR}$$

4) G. B. WILLIAMS FLOOD COMMITTEE

$$T = 0.908\, L \sqrt[5]{\frac{1}{FD}}$$

T = PERIOD IN HOURS

L = LENGTH OF CATCHMENT IN MILES

D = DIAMETER IN MILES OF A CIRCLE OF EQUAL AREA

$$A = \pi D^2/4$$

$$8.8 = .785\, D^2$$

$$D = 3.35$$

F = CATCHMENT SLOPE IN PERCENT

$$T = .908\, (29{,}500/5280)\, (1.25 \times 3.35)^{-.2}$$

$$= 3.81 \text{ HR}$$

Lag = .6 x 3.81 Hr.

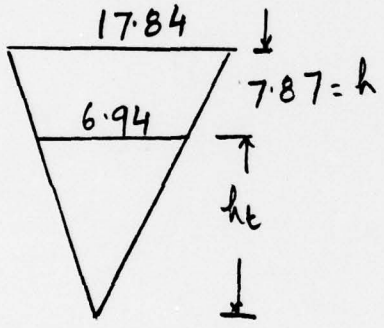
LAG = .6 T_c = 2.28 HR

FREDERIC R. HARRIS, INC.
CONSULTING ENGINEERS

SUBJECT N.J. Dam Inspection — Van Doran's Mill Dam
SHEET NO. 5 OF
JOB NO. 15-A20-01
COMPUTED BY S.B. CHECKED BY
DATE Aug. 1979

Reservoir stage area relations

Elevation	Area (Acres)
239.09	0
252.13	6.94 (From U.S.G.S quad)
260	17.84
280	99



$$h_t = h / \left(\sqrt{A_2/A_1} - 1\right)$$

$$= 7.87 / .1033$$

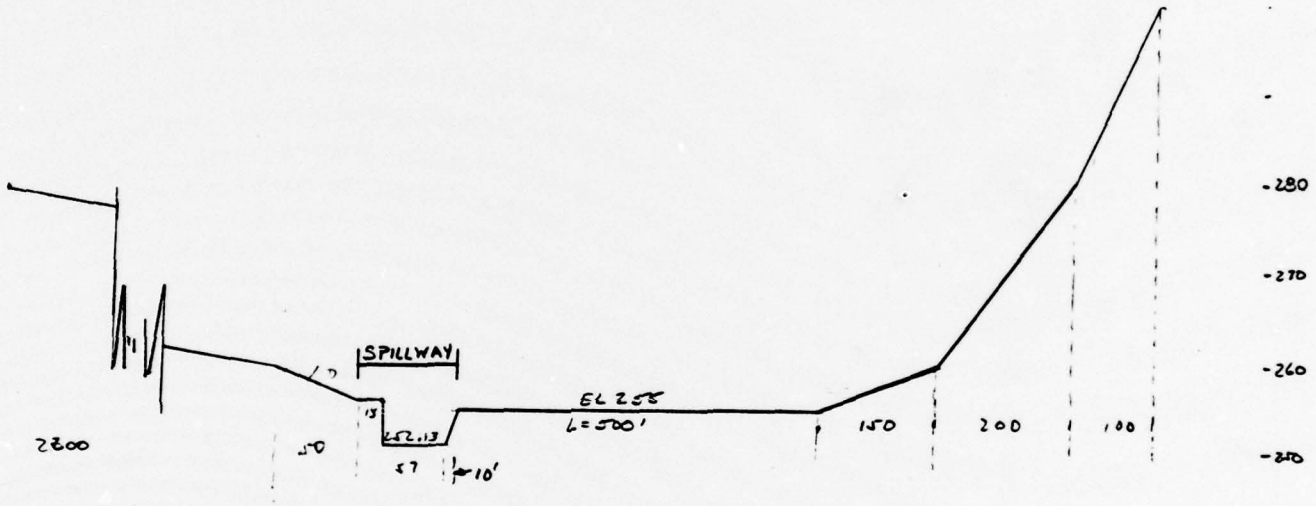
$$= 13.04$$

FREDERIC R. HARRIS, INC.
CONSULTING ENGINEERS

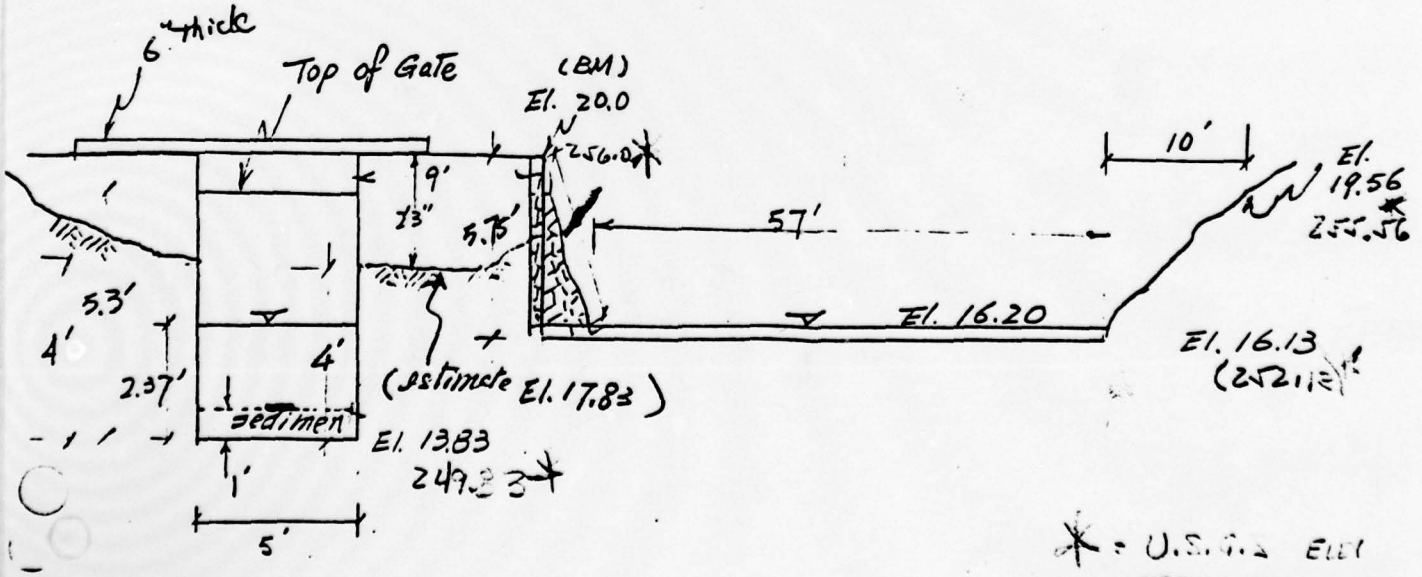
SUBJECT N. J. Dam Inspection — SHEET NO. 6 OF
YAN DORANS MILL DAM — JOB NO. 12-A20-01
COMPUTED BY HF2 — CHECKED BY — DATE JULY 1971

USING THE ELEVATIONS FROM THE MAP "ESTATE OF WILLIAM CHILDS, BERNARDSVILLE NEW JERSEY" OCTOBER 1940; ESTIMATE A RELATIONSHIP TO THE U.S.G.S QUAD OF 103. FT = 260 FT ∴ THE EARTH DAM (EMBANKMENT) IS ASSUMED CONSTANT AT 255 FT

RATING CURVE



OVERALL ELEVATION



SPILLWAY DETAILS

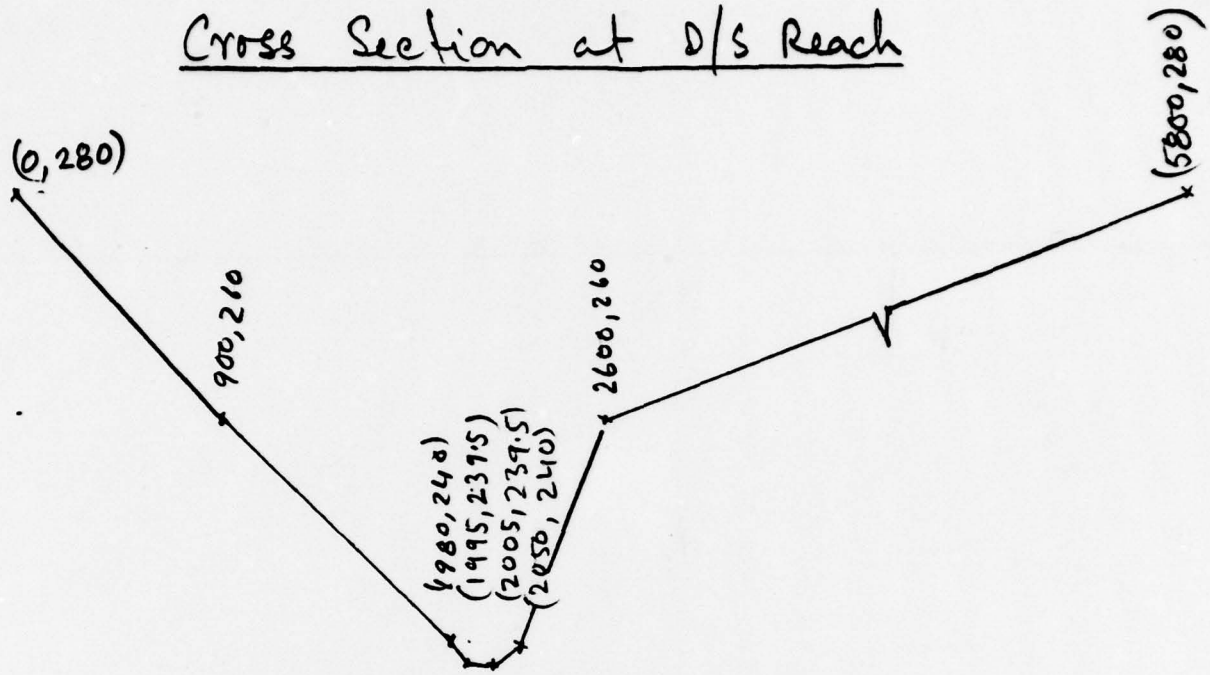
FREDERIC R. HARRIS, INC.
CONSULTING ENGINEERS

SUBJECT: N.J. Dam Inspection — Van Dorens Mill Dam
SHEET NO. 7 OF
JOB NO. 10-A20-07
COMPUTED BY: JFZ CHECKED BY:
DATE: July, 1979

ELEV	C_1	L_1	H_1	Q_1	C_2	L_2	H_2	Q_2	C_3	L_3	H_3	Q_3	C_4	L_4	H_4		Q
252	3.85	4'	2.17	49.2													49.2
254	3.8	4'	4.17	129	3.4	57	1.87	496									625.0
255	3.8	4'	5.17	178.7	3.4	57	2.87	942.3									1121
260	3.8	4'	10.17	441.1	3.7	57	7.87	4656	2.7	510	5	15,395	2.7	200	2.5	553	21,045
256	3.8	4	6.17	233	3.4	57	3.87	1475	2.7	510	1	1377	2.7	40	.5	38	3123
257	3.8	4	7.17	292	3.5	57	4.87	2144	2.7	510	2	3895	2.7	80	1.0	216	6547
258	3.8	4	8.17	355	3.6	57	5.87	2918	2.7	510	3	7155	2.7	120	1.5	729	11,157

$Q = CLH^{3/2}$

Cross Section at D/S Reach



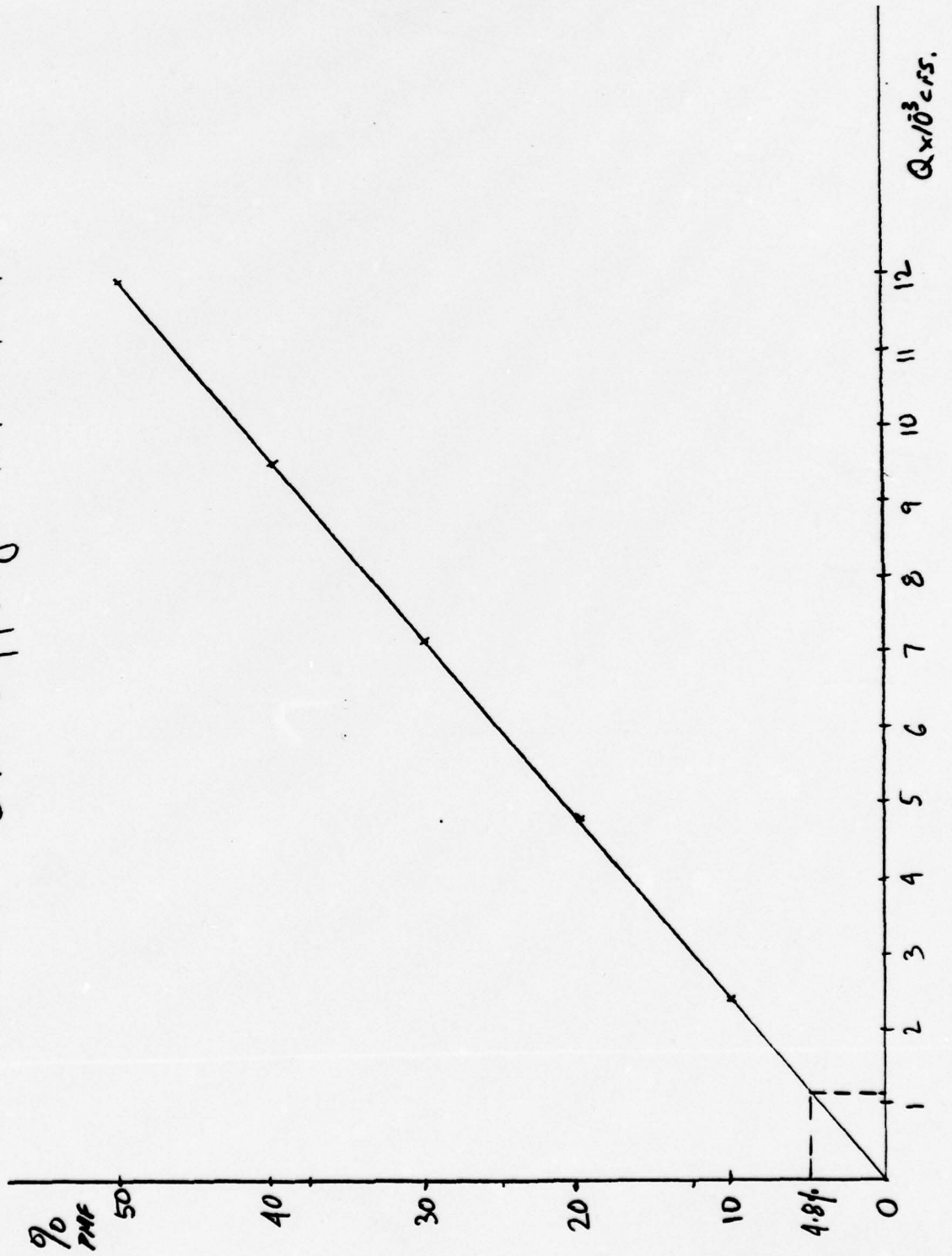
Slope = .001

Cross section of reach at 1800 ft D/S of Dam

FREDERIC R. HARRIS, INC.
CONSULTING ENGINEERS

SUBJECT N.J. Dam Inspection
Van Doran's Mill Dam
COMPUTED BY S.B. CHECKED BY

SHEET NO. 9 OF
JOB NO. 10-A20-07
DATE August, 1979



FREDERIC R. HARRIS, INC.
CONSULTING ENGINEERS

SUBJECT N.J. Dam Inspection
Van Dorens Mill Dam
COMPUTED BY S.B. CHECKED BY

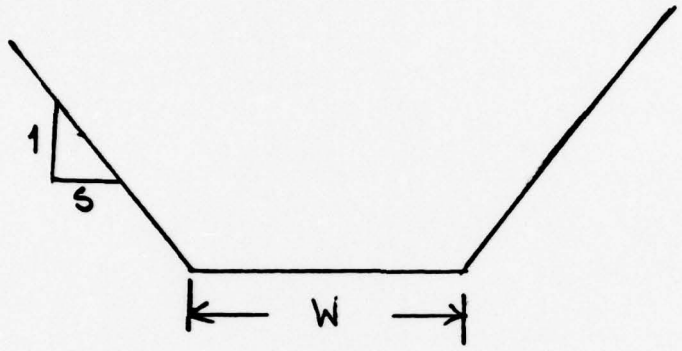
SHEET NO. 17 OF
JOB NO. 12-A20-01
DATE Aug, 1979

Overtopping Potential

% PMF	Q	Max W.SEL	Max. feet above Dam	Duration of flooding (Hrs)	Max. W.S el 1800 ft D/S
10	2385	255.63	.63	4.5	245.3
20	4773	256.48	1.48	7.0	247.4
30	7165	257.13	2.13	8.3	248.9
40	9547	257.65	2.65	9.3	250.1
50	11,934	258.16	3.16	9.8	251.2

Breach Analysis

Assume breach begins to develop when reservoir stage reaches 1' above the Dam.



Slope 1:S
Width of breach bottom = W
T = Time in hours, for breach to develop to maximum size

Five trial analysis was considered

1)	S = 1	W = 25	T = .5 hrs
2)	S = 0	W = 50	T = .75 hrs
3)	S = 1	W = 75	T = 1
4)	S = 1	W = 100	T = 1
5)	S = 1	W = 200	T = 1

In all the cases there is no increase in Stage at the D/S due to Dam Break. There is significant damage at the elevation in the downstream reach.

Reservoir Evaluation

a) Discharge Vs. Head

Effective length of gate = 4'

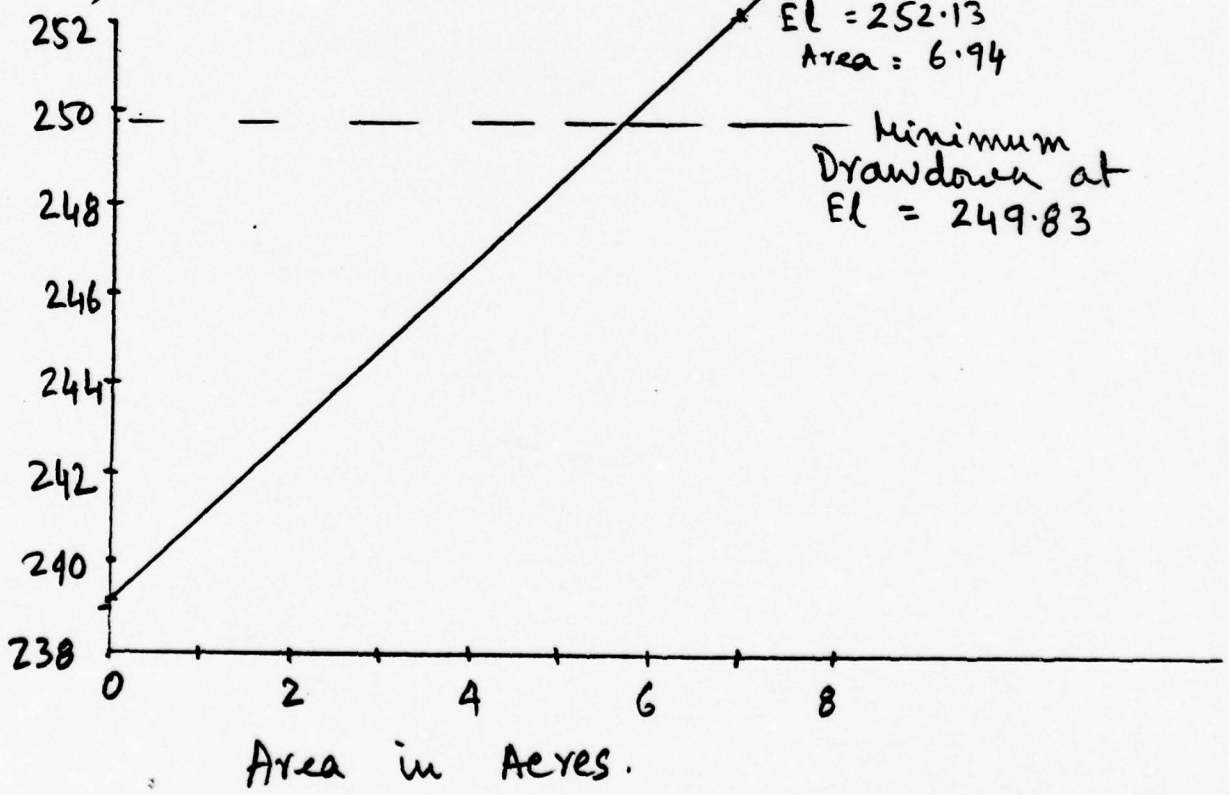
Flow through gate

$$Q = C_1 L_1 H_1^{3/2}$$ (see page 7 of comp. sheet)

$$= 3.85 \times 4 \times (Z - 249.83)^{1.5}$$

Where Z = W.S. el.

b) Area Vs. Head



c) Drainage area = 8.8 sq mi

Inflow = 2 cfs / sq miles
= 17.6 cfs.

El z	Area (Ac)	Av. Area (Ac)	Vol AF	Head on outlet z - 249.83 H	outlet Q 15.4 H	Time to draw: t_1 $\frac{Vol \times 24}{1.98 \times Q}$ (hrs)	Time to Draw 17.6 cfs $\frac{17.6 \times t_1}{Q}$ t_2 (hrs)	Total time t_1+t_2 hrs
252.13	6.94							
		6.85	.89	2.23	51.3	.21	.07	.28
252	6.75							
		6.50	6.50	1.67	33.3	2.37	1.25	3.62
251	6.2							
		5.95	5.95	.67	8.5	8.48	17.55	26.03
250	5.7							
		5.65	.96	.085	.4	29.09	1280.	1309
249.83	5.6							
						≈ 40 hrs		1339 hrs

Time of drawdown with no inflow
= 40 hrs = 1 day 16 hrs

Time of drawdown with inflow of 2 cfs/SM
= 1339 hrs = 55 days 19 hrs.

HEC1-DB

COMPUTER PRINT-OUT

```
**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION     JULY 1978
  LAST MODIFICATION  26 FEB 79
**********
    1                A1      N.J. DAM INSPECTION
    2                A2      VAN DORANS MILL DAM
    3                A3      MUTTIRATIO PMF ROUTING
    4                B    100       0      15       0       0       0       0       0       0       0
    5                B1     5
    6                J      1       5       1
    7                J1    .5      .4      .3      .2      .1
    8                K              RES                             1
    9                K1      LOCAL INFLOW TO RESERVOIR
   10                M      1       2     8.8               8.8                             1
   11                P              23     114     124     133     143
   12                T                                                      1.33     .07             .01
   13                W2          2.28
   14                X     -1    -.05       2
   15                K      1      DAM                              1
   16                K1      ROUTING THROUGH VAN DORANS MILL DAM
   17                Y                                      1       1
   18                Y1     1                                               -249.8      -1
   19                Y4 249.8     252     254     255     256     257     258     260
   20                Y5     0    49.2     625    1121    3123    6547   11157   21045
   21                $A          6.94   17.84      99
   22                $E239.09  252.13     260     280
   23                $$252.13
   24                $D   255
   25                K      1 REACH 1                                1
   26                K1      CHANNEL ROUTING MOD. PULS. REACH 1
   27                Y                                      1       1
   28                Y1     1
   29                Y6    .1    .045      .1   239.5     270    1800    .001
   30                Y7           280     900     260    1980     240    1995   239.5    2005   239.5
   31                Y7  2050     240    2600     260    5800     280
   32                K     99
```

PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

```
RUNOFF HYDROGRAPH AT          RES
ROUTE HYDROGRAPH TO           DAM
ROUTE HYDROGRAPH TO        EACH 1
END OF NETWORK
```

```
**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  26 FEB 79
**********

RUN  DATE= 79/08/15.
     TIME= 13.10.18.
```

N.J. DAM INSPECTION
VAN DORANS MILL DAM
MUTTIRATIO PMF ROUTING

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
100	0	15	0	0	0	0	0	0	0
			JOPER	NWT	LROPT	TRACE			
			5	0	0	0			

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 5 LRTIO= 1

RTIOS=	.50	.40	.30	.20	.10

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

LOCAL INFLOW TO RESERVOIR

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
RES	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	THSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	2	8.80	0.00	8.80	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	23.00	114.00	124.00	133.00	143.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .800

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.33	.07	0.00	.01

UNIT HYDROGRAPH DATA
TC= 0.00 LAG= 2.28

RECESSION DATA
STRTQ= -1.00 QRCSN= -.05 RTIOR= 2.00

UNIT HYDROGRAPH 48 END OF PERIOD ORDINATES, TC= 0.00 HOURS, LAG= 2.28 VOL= 1.00

58.	189.	361.	593.	898.	1234.	1504.	1679.	1757.	1762.
1705.	1586.	1449.	1282.	1077.	879.	731.	614.	517.	444.
377.	320.	265.	226.	190.	162.	135.	115.	95.	82.
69.	58.	49.	42.	35.	30.	25.	21.	18.	16.
14.	12.	9.	8.	6.	4.	2.	0.		

END OF PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.01	.15	1	.00	.00	.00	8.	1.02	.15	97	.03	.01	.02	26.
1.01	.30	2	.00	.00	.00	8.	1.02	.30	98	.03	.01	.02	24.
1.01	.45	3	.00	.00	.00	7.	1.02	.45	99	.03	.01	.02	24.
1.01	1.00	4	.00	.00	.00	7.	1.02	1.00	100	.03	.01	.02	28.
1.01	1.15	5	.00	.00	.00	6.	0.00	0.00	101	.03	.01	.02	35.
1.01	1.30	6	.00	.00	.00	6.	0.00	0.00	102	.03	.01	.02	45.
1.01	1.45	7	.00	.00	.00	6.	0.00	0.00	103	.03	.01	.02	59.
1.01	2.00	8	.00	.00	.00	5.	0.00	0.00	104	.03	.01	.02	75.
1.01	2.15	9	.00	.00	.00	5.	0.00	0.00	105	.03	.01	.02	92.
1.01	2.30	10	.00	.00	.00	5.	0.00	0.00	106	.03	.01	.02	109.
1.01	2.45	11	.00	.00	.00	4.	0.00	0.00	107	.03	.01	.02	126.
1.01	3.00	12	.00	.00	.00	4.	0.00	0.00	108	.03	.01	.02	141.
1.01	3.15	13	.00	.00	.00	4.	0.00	0.00	109	.03	.01	.02	155.
1.01	3.30	14	.00	.00	.00	4.	0.00	0.00	110	.03	.01	.02	168.
1.01	3.45	15	.00	.00	.00	3.	0.00	0.00	111	.03	.01	.02	178.
1.01	4.00	16	.00	.00	.00	3.	0.00	0.00	112	.03	.01	.02	187.
1.01	4.15	17	.00	.00	.00	3.	0.00	0.00	113	.03	.01	.02	194.
1.01	4.30	18	.00	.00	.00	3.	0.00	0.00	114	.03	.01	.02	200.
1.01	4.45	19	.00	.00	.00	3.	0.00	0.00	115	.03	.01	.02	205.
1.01	5.00	20	.00	.00	.00	3.	0.00	0.00	116	.03	.01	.02	209.
1.01	5.15	21	.00	.00	.00	2.	0.00	0.00	117	.03	.01	.02	213.
1.01	5.30	22	.00	.00	.00	2.	0.00	0.00	118	.03	.01	.02	216.
1.01	5.45	23	.00	.00	.00	2.	0.00	0.00	119	.03	.01	.02	219.
1.01	6.00	24	.00	.00	.00	2.	0.00	0.00	120	.03	.01	.02	221.
1.01	6.15	25	.01	.00	.01	2.	0.00	0.00	121	.08	.06	.02	226.
1.01	6.30	26	.01	.00	.01	2.	0.00	0.00	122	.08	.06	.02	237.
1.01	6.45	27	.01	.00	.01	2.	0.00	0.00	123	.08	.06	.02	256.
1.01	7.00	28	.01	.00	.01	2.	0.00	0.00	124	.08	.06	.02	286.
1.01	7.15	29	.01	.00	.01	2.	0.00	0.00	125	.08	.06	.02	331.
1.01	7.30	30	.01	.00	.01	2.	0.00	0.00	126	.08	.06	.02	393.
1.01	7.45	31	.01	.00	.01	2.	0.00	0.00	127	.08	.06	.02	467.
1.01	8.00	32	.01	.00	.01	2.	0.00	0.00	128	.08	.06	.02	550.
1.01	8.15	33	.01	.00	.01	2.	0.00	0.00	129	.08	.06	.02	637.
1.01	8.30	34	.01	.00	.01	2.	0.00	0.00	130	.08	.06	.02	724.
1.01	8.45	35	.01	.00	.01	2.	0.00	0.00	131	.08	.06	.02	808.
1.01	9.00	36	.01	.00	.01	2.	0.00	0.00	132	.08	.06	.02	886.
1.01	9.15	37	.01	.00	.01	2.	0.00	0.00	133	.08	.06	.02	957.
1.01	9.30	38	.01	.00	.01	2.	0.00	0.00	134	.08	.06	.02	1020.
1.01	9.45	39	.01	.00	.01	2.	0.00	0.00	135	.08	.06	.02	1073.
1.01	10.00	40	.01	.00	.01	2.	0.00	0.00	136	.08	.06	.02	1117.
1.01	10.15	41	.01	.00	.01	2.	0.00	0.00	137	.08	.06	.02	1153.
1.01	10.30	42	.01	.00	.01	2.	0.00	0.00	138	.08	.06	.02	1183.
1.01	10.45	43	.01	.00	.01	2.	0.00	0.00	139	.08	.06	.02	1208.
1.01	11.00	44	.01	.00	.01	2.	0.00	0.00	140	.08	.06	.02	1230.
1.01	11.15	45	.01	.00	.01	2.	0.00	0.00	141	.08	.06	.02	1249.
1.01	11.30	46	.01	.00	.01	2.	0.00	0.00	142	.08	.06	.02	1264.
1.01	11.45	47	.01	.00	.01	2.	0.00	0.00	143	.08	.06	.02	1278.
1.01	12.00	48	.01	.00	.01	2.	0.00	0.00	144	.08	.06	.02	1289.
1.01	12.15	49	.04	.00	.04	2.	0.00	0.00	145	.52	.51	.02	1324.
1.01	12.30	50	.04	.00	.04	2.	0.00	0.00	146	.52	.51	.02	1417.
1.01	12.45	51	.04	.00	.04	2.	0.00	0.00	147	.52	.51	.02	1585.
1.01	13.00	52	.04	.00	.04	2.	0.00	0.00	148	.52	.51	.02	1856.
1.01	13.15	53	.05	.00	.05	2.	0.00	0.00	149	.63	.61	.02	2269.
1.01	13.30	54	.05	.00	.05	3.	0.00	0.00	150	.63	.61	.02	2845.
1.01	13.45	55	.05	.00	.05	3.	0.00	0.00	151	.63	.61	.02	3560.
1.01	14.00	56	.05	.00	.05	4.	0.00	0.00	152	.63	.61	.02	4377.
1.01	14.15	57	.06	.00	.06	4.	0.00	0.00	153	.79	.77	.02	5269.
1.01	14.30	58	.06	.00	.06	5.	0.00	0.00	154	.79	.77	.02	6219.
1.01	14.45	59	.06	.00	.06	6.	0.00	0.00	155	.79	.77	.02	7199.
1.01	15.00	60	.06	.00	.06	7.	0.00	0.00	156	.79	.77	.02	8180.
1.01	15.15	61	.06	.00	.06	7.	0.00	0.00	157	.80	.78	.02	9156.
1.01	15.30	62	.12	.00	.12	8.	0.00	0.00	158	1.59	1.58	.02	10158.
1.01	15.45	63	.34	.00	.33	9.	0.00	0.00	159	4.46	4.45	.02	11378.

1.01	16.15	65	.06	.04	.02	20.	0.00	0.00	161	.73	.72	.02	14465.
1.01	16.30	66	.06	.04	.02	33.	0.00	0.00	162	.73	.72	.02	16301.
1.01	16.45	67	.06	.04	.02	56.	0.00	0.00	163	.73	.72	.02	18366.
1.01	17.00	68	.06	.04	.02	89.	0.00	0.00	164	.73	.72	.02	20435.
1.01	17.15	69	.04	.03	.02	134.	0.00	0.00	165	.58	.56	.02	22096.
1.01	17.30	70	.04	.03	.02	188.	0.00	0.00	166	.58	.56	.02	23205.
1.01	17.45	71	.04	.03	.02	246.	0.00	0.00	167	.58	.56	.02	23762.
1.01	18.00	72	.04	.03	.02	304.	0.00	0.00	168	.58	.56	.02	23862.
1.01	18.15	73	.00	.00	.00	357.	0.00	0.00	169	.04	.02	.02	23532.
1.01	18.30	74	.00	.00	.00	401.	0.00	0.00	170	.04	.02	.02	22779.
1.01	18.45	75	.00	.00	.00	434.	0.00	0.00	171	.04	.02	.02	21746.
1.01	19.00	76	.00	.00	.00	453.	0.00	0.00	172	.04	.02	.02	20401.
1.01	19.15	77	.00	.00	.00	456.	0.00	0.00	173	.04	.02	.02	18720.
1.01	19.30	78	.00	.00	.00	444.	0.00	0.00	174	.04	.02	.02	16901.
1.01	19.45	79	.00	.00	.00	418.	0.00	0.00	175	.04	.02	.02	15152.
1.01	20.00	80	.00	.00	.00	383.	0.00	0.00	176	.04	.02	.02	13477.
1.01	20.15	81	.00	.00	.00	344.	0.00	0.00	177	.04	.02	.02	11877.
1.01	20.30	82	.00	.00	.00	302.	0.00	0.00	178	.04	.02	.02	10397.
1.01	20.45	83	.00	.00	.00	262.	0.00	0.00	179	.04	.02	.02	9014.
1.01	21.00	84	.00	.00	.00	224.	0.00	0.00	180	.04	.02	.02	7763.
1.01	21.15	85	.00	.00	.00	190.	0.00	0.00	181	.04	.02	.02	6631.
1.01	21.30	86	.00	.00	.00	160.	0.00	0.00	182	.04	.02	.02	5669.
1.01	21.45	87	.00	.00	.00	134.	0.00	0.00	183	.04	.02	.02	4849.
1.01	22.00	88	.00	.00	.00	113.	0.00	0.00	184	.04	.02	.02	4180.
1.01	22.15	89	.00	.00	.00	96.	0.00	0.00	185	.04	.02	.02	3611.
1.01	22.30	90	.00	.00	.00	81.	0.00	0.00	186	.04	.02	.02	3138.
1.01	22.45	91	.00	.00	.00	69.	0.00	0.00	187	.04	.02	.02	2735.
1.01	23.00	92	.00	.00	.00	58.	0.00	0.00	188	.04	.02	.02	2398.
1.01	23.15	93	.00	.00	.00	49.	0.00	0.00	189	.04	.02	.02	2108.
1.01	23.30	94	.00	.00	.00	41.	0.00	0.00	190	.04	.02	.02	1864.
1.01	23.45	95	.00	.00	.00	35.	0.00	0.00	191	.04	.02	.02	1659.
1.02	0.00	96	.00	.00	.00	30.	0.00	0.00	192	.04	.02	.02	1484.
									SUM	26.31	23.11	3.20	514021.
										(668.)	(587.)	(81.)	(14555.45)

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	23862.	16583.	5276.	2673.	513267.
CMS	676.	470.	149.	76.	14534.
INCHES		17.53	22.31	22.61	22.61
MM		445.26	566.60	574.21	574.21
AC-FT		8223.	10464.	10605.	10605.
THOUS CU M		10143.	12907.	13081.	13081.

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 .50	RATIO 2 .40	RATIO 3 .30	RATIO 4 .20	RATIO 5 .10
HYDROGRAPH AT	RES	8.80	1	11931.	9545.	7159.	4772.	2386.
		(22.79)		(337.85)(	270.28)(	202.71)(	135.14)(	67.57)(
ROUTED TO	DAM	8.80	1	11934.	9547.	7165.	4773.	2385.
		(22.79)		(337.94)(	270.34)(	202.88)(	135.17)(	67.53)(
ROUTED TO	EACH 1	8.80	1	11855.	9478.	7102.	4728.	2357.
		(22.79)		(335.69)(	268.39)(	201.11)(	133.88)(	66.75)(

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	249.80	252.13	255.00
STORAGE	17.	30.	55.
OUTFLOW	0.	87.	1121.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.50	258.16	3.16	94.	11934.	9.75	42.00	0.00
.40	257.65	2.65	87.	9547.	9.25	42.00	0.00
.30	257.13	2.13	80.	7165.	8.25	42.00	0.00
.20	256.48	1.48	72.	4773.	7.00	42.00	0.00
.10	255.63	.63	62.	2385.	4.50	42.00	0.00

PLAN 1 STATION EACH 1

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.50	11855.	251.2	42.25
.40	9478.	250.1	42.25
.30	7102.	248.9	42.25
.20	4728.	247.4	42.25
.10	2357.	245.3	42.25

```
**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  26 FEB 79
**********
    1                A1      N.J. DAM INSPECTION
    2                A2      VAN DORANS MILL DAM
    3                A3      DAM FAILURE ANALYSIS
    4                B    100       0      15       0       0       0       0       0       0       0
    5                B1     5
    6                J      5       1       1
    7                J1    .5
    8                K              RES                                             1
    9                K1      LOCAL INFLOW TO RESERVOIR
   10                M      1       2     8.8               8.8                             1
   11                P              23     114     124     133     143
   12                T                                                      1.33     .07             .01
   13                W2          2.28
   14                X     -1    -.05       2
   15                K      1      DAM                                             1
   16                K1      ROUTING THROUGH VAN DORANS MILL DAM
   17                Y                                      1       1
   18                Y1     1                                               -249.8      -1
   19                Y4 249.8     252     254     255     256     257     258     260
   20                Y5     0    49.2     625    1121    3123    6547   11157   21045
   21                $A           6.94   17.84      99
   22                $E239.09  252.13     260     280
   23                $$252.13
   24                $D   255
   25                $B    25       1     245      .5   252.4     256
   26                $B    50             245     .75   252.4     256
   27                $B    75       1     245       1   252.4     256
   28                $B   100       1     245       1   252.4     256
   29                $B   200       1     245       1   252.4     256
   30                K      1 REACH 1                                               1
   31                K1      CHANNEL ROUTING MOD. PULS. REACH 1
   32                Y                                      1       1
   33                Y1     1
   34                Y6    .1    .045      .1   239.5     270    1800    .001
   35                Y7           280     900     260    1980     240    1995   239.5    2005   239.5
   36                Y7  2050     240    2600     260    5800     280
   37                K     99
```

PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

```
RUNOFF HYDROGRAPH AT          RES
ROUTE HYDROGRAPH TO           DAM
ROUTE HYDROGRAPH TO        EACH 1
END OF NETWORK
```

****
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 26 FEB 79
****

RUN DATE# 79/08/15.
TIME# 13.36.23.

N.J. DAM INSPECTION
VAN DORANS MILL DAM
DAM FAILURE ANALYSIS

JOB SPECIFICATION

NO	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
100	0	15	0	0	0	0	0	0	0
			JOPER	NWT	LROPT	TRACE			
			5	0	0	0			

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 5 NRTIO= 1 LRTIO= 1

RTIOS= .50

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

LOCAL INFLOW TO RESERVOIR

ISTAO	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
RES	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	2	8.80	0.00	8.80	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	23.00	114.00	124.00	133.00	143.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .800

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.33	.07	0.00	.01

UNIT HYDROGRAPH DATA
TC= 0.00 LAG= 2.28

RECESSION DATA
STRTQ= -1.00 QRCSN= -.05 RTIOR= 2.00

UNIT HYDROGRAPH 48 END OF PERIOD ORDINATES, TC= 0.00 HOURS, LAG= 2.28 VOL= 1.00

58.	189.	361.	593.	898.	1234.	1504.	1679.	1757.	1762.
1705.	1586.	1449.	1282.	1077.	879.	731.	614.	517.	444.
377.	320.	265.	226.	190.	162.	135.	115.	95.	82.
69.	58.	49.	42.	35.	30.	25.	21.	18.	16.
14.	12.	9.	8.	6.	4.	2.	0.		

0 END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q

1.01	.15	1	.00	.00	.00	8.	1.02	.15	97	.03	.01	.02	26.
1.01	.30	2	.00	.00	.00	8.	1.02	.30	98	.03	.01	.02	24.
1.01	.45	3	.00	.00	.00	7.	1.02	.45	99	.03	.01	.02	24.
1.01	1.00	4	.00	.00	.00	7.	1.02	1.00	100	.03	.01	.02	28.
1.01	1.15	5	.00	.00	.00	6.	0.00	0.00	101	.03	.01	.02	35.
1.01	1.30	6	.00	.00	.00	6.	0.00	0.00	102	.03	.01	.02	45.
1.01	1.45	7	.00	.00	.00	6.	0.00	0.00	103	.03	.01	.02	59.
1.01	2.00	8	.00	.00	.00	5.	0.00	0.00	104	.03	.01	.02	75.
1.01	2.15	9	.00	.00	.00	5.	0.00	0.00	105	.03	.01	.02	92.
1.01	2.30	10	.00	.00	.00	5.	0.00	0.00	106	.03	.01	.02	109.
1.01	2.45	11	.00	.00	.00	4.	0.00	0.00	107	.03	.01	.02	126.
1.01	3.00	12	.00	.00	.00	4.	0.00	0.00	108	.03	.01	.02	141.
1.01	3.15	13	.00	.00	.00	4.	0.00	0.00	109	.03	.01	.02	155.
1.01	3.30	14	.00	.00	.00	4.	0.00	0.00	110	.03	.01	.02	168.
1.01	3.45	15	.00	.00	.00	3.	0.00	0.00	111	.03	.01	.02	178.
1.01	4.00	16	.00	.00	.00	3.	0.00	0.00	112	.03	.01	.02	187.
1.01	4.15	17	.00	.00	.00	3.	0.00	0.00	113	.03	.01	.02	194.
1.01	4.30	18	.00	.00	.00	3.	0.00	0.00	114	.03	.01	.02	200.
1.01	4.45	19	.00	.00	.00	3.	0.00	0.00	115	.03	.01	.02	205.
1.01	5.00	20	.00	.00	.00	3.	0.00	0.00	116	.03	.01	.02	209.
1.01	5.15	21	.00	.00	.00	2.	0.00	0.00	117	.03	.01	.02	213.
1.01	5.30	22	.00	.00	.00	2.	0.00	0.00	118	.03	.01	.02	216.
1.01	5.45	23	.00	.00	.00	2.	0.00	0.00	119	.03	.01	.02	219.
1.01	6.00	24	.00	.00	.00	2.	0.00	0.00	120	.03	.01	.02	221.
1.01	6.15	25	.01	.00	.01	2.	0.00	0.00	121	.08	.06	.02	226.
1.01	6.30	26	.01	.00	.01	2.	0.00	0.00	122	.08	.06	.02	237.
1.01	6.45	27	.01	.00	.01	2.	0.00	0.00	123	.08	.06	.02	256.
1.01	7.00	28	.01	.00	.01	2.	0.00	0.00	124	.08	.06	.02	286.
1.01	7.15	29	.01	.00	.01	2.	0.00	0.00	125	.08	.06	.02	331.
1.01	7.30	30	.01	.00	.01	2.	0.00	0.00	126	.08	.06	.02	393.
1.01	7.45	31	.01	.00	.01	2.	0.00	0.00	127	.08	.06	.02	467.
1.01	8.00	32	.01	.00	.01	2.	0.00	0.00	128	.08	.06	.02	550.
1.01	8.15	33	.01	.00	.01	2.	0.00	0.00	129	.08	.06	.02	637.
1.01	8.30	34	.01	.00	.01	2.	0.00	0.00	130	.08	.06	.02	724.
1.01	8.45	35	.01	.00	.01	2.	0.00	0.00	131	.08	.06	.02	808.
1.01	9.00	36	.01	.00	.01	2.	0.00	0.00	132	.08	.06	.02	886.
1.01	9.15	37	.01	.00	.01	2.	0.00	0.00	133	.08	.06	.02	957.
1.01	9.30	38	.01	.00	.01	2.	0.00	0.00	134	.08	.06	.02	1020.
1.01	9.45	39	.01	.00	.01	2.	0.00	0.00	135	.08	.06	.02	1073.
1.01	10.00	40	.01	.00	.01	2.	0.00	0.00	136	.08	.06	.02	1117.
1.01	10.15	41	.01	.00	.01	2.	0.00	0.00	137	.08	.06	.02	1153.
1.01	10.30	42	.01	.00	.01	2.	0.00	0.00	138	.08	.06	.02	1183.
1.01	10.45	43	.01	.00	.01	2.	0.00	0.00	139	.08	.06	.02	1208.
1.01	11.00	44	.01	.00	.01	2.	0.00	0.00	140	.08	.06	.02	1230.
1.01	11.15	45	.01	.00	.01	2.	0.00	0.00	141	.08	.06	.02	1249.
1.01	11.30	46	.01	.00	.01	2.	0.00	0.00	142	.08	.06	.02	1264.
1.01	11.45	47	.01	.00	.01	2.	0.00	0.00	143	.08	.06	.02	1278.
1.01	12.00	48	.01	.00	.01	2.	0.00	0.00	144	.08	.06	.02	1289.
1.01	12.15	49	.04	.00	.04	2.	0.00	0.00	145	.52	.51	.02	1324.
1.01	12.30	50	.04	.00	.04	2.	0.00	0.00	146	.52	.51	.02	1417.
1.01	12.45	51	.04	.00	.04	2.	0.00	0.00	147	.52	.51	.02	1585.
1.01	13.00	52	.04	.00	.04	2.	0.00	0.00	148	.52	.51	.02	1856.
1.01	13.15	53	.05	.00	.05	2.	0.00	0.00	149	.63	.61	.02	2269.
1.01	13.30	54	.05	.00	.05	3.	0.00	0.00	150	.63	.61	.02	2845.
1.01	13.45	55	.05	.00	.05	3.	0.00	0.00	151	.63	.61	.02	3560.
1.01	14.00	56	.05	.00	.05	4.	0.00	0.00	152	.63	.61	.02	4377.
1.01	14.15	57	.06	.00	.06	4.	0.00	0.00	153	.79	.77	.02	5269.
1.01	14.30	58	.06	.00	.06	5.	0.00	0.00	154	.79	.77	.02	6219.
1.01	14.45	59	.06	.00	.06	6.	0.00	0.00	155	.79	.77	.02	7199.
1.01	15.00	60	.06	.00	.06	7.	0.00	0.00	156	.79	.77	.02	8180.
1.01	15.15	61	.06	.00	.06	7.	0.00	0.00	157	.80	.78	.02	9156.
1.01	15.30	62	.12	.00	.12	8.	0.00	0.00	158	1.59	1.58	.02	10158.
1.01	15.45	63	.34	.00	.33	9.	0.00	0.00	159	4.46	4.45	.02	11378.
1.01	16.00	64	.08	.03	.05	12.	0.00	0.00	160	1.12	1.10	.02	12846.
1.01	16.15	65	.06	.04	.02	20.	0.00	0.00	161	.73	.72	.02	14465.

1.01	16.30	66	.06	.04	.02	55.	0.00	0.00	162	.73	.72	.02	18366.
1.01	16.45	67	.06	.04	.02	56.	0.00	0.00	163	.73	.72	.02	18366.
1.01	17.00	68	.06	.04	.02	89.	0.00	0.00	164	.73	.72	.02	20435.
1.01	17.15	69	.04	.03	.02	134.	0.00	0.00	165	.58	.56	.02	22096.
1.01	17.30	70	.04	.03	.02	188.	0.00	0.00	166	.58	.56	.02	23205.
1.01	17.45	71	.04	.03	.02	246.	0.00	0.00	167	.58	.56	.02	23762.
1.01	18.00	72	.04	.03	.02	304.	0.00	0.00	168	.58	.56	.02	23862.
1.01	18.15	73	.00	.00	.00	357.	0.00	0.00	169	.04	.02	.02	23532.
1.01	18.30	74	.00	.00	.00	401.	0.00	0.00	170	.04	.02	.02	22779.
1.01	18.45	75	.00	.00	.00	434.	0.00	0.00	171	.04	.02	.02	21746.
1.01	19.00	76	.00	.00	.00	453.	0.00	0.00	172	.04	.02	.02	20401.
1.01	19.15	77	.00	.00	.00	456.	0.00	0.00	173	.04	.02	.02	18720.
1.01	19.30	78	.00	.00	.00	444.	0.00	0.00	174	.04	.02	.02	16901.
1.01	19.45	79	.00	.00	.00	418.	0.00	0.00	175	.04	.02	.02	15152.
1.01	20.00	80	.00	.00	.00	383.	0.00	0.00	176	.04	.02	.02	13477.
1.01	20.15	81	.00	.00	.00	344.	0.00	0.00	177	.04	.02	.02	11877.
1.01	20.30	82	.00	.00	.00	302.	0.00	0.00	178	.04	.02	.02	10397.
1.01	20.45	83	.00	.00	.00	262.	0.00	0.00	179	.04	.02	.02	9014.
1.01	21.00	84	.00	.00	.00	224.	0.00	0.00	180	.04	.02	.02	7763.
1.01	21.15	85	.00	.00	.00	190.	0.00	0.00	181	.04	.02	.02	6631.
1.01	21.30	86	.00	.00	.00	160.	0.00	0.00	182	.04	.02	.02	5669.
1.01	21.45	87	.00	.00	.00	134.	0.00	0.00	183	.04	.02	.02	4849.
1.01	22.00	88	.00	.00	.00	113.	0.00	0.00	184	.04	.02	.02	4180.
1.01	22.15	89	.00	.00	.00	96.	0.00	0.00	185	.04	.02	.02	3611.
1.01	22.30	90	.00	.00	.00	81.	0.00	0.00	186	.04	.02	.02	3138.
1.01	22.45	91	.00	.00	.00	69.	0.00	0.00	187	.04	.02	.02	2735.
1.01	23.00	92	.00	.00	.00	58.	0.00	0.00	188	.04	.02	.02	2398.
1.01	23.15	93	.00	.00	.00	49.	0.00	0.00	189	.04	.02	.02	2108.
1.01	23.30	94	.00	.00	.00	41.	0.00	0.00	190	.04	.02	.02	1864.
1.01	23.45	95	.00	.00	.00	35.	0.00	0.00	191	.04	.02	.02	1659.
1.02	0.00	96	.00	.00	.00	30.	0.00	0.00	192	.04	.02	.02	1484.
									SUM	26.31	23.11	3.20	514021.
										(668.)	(587.)	(81.)	(14555.45)

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	23862.	16583.	5276.	2673.	513267.
CMS	676.	470.	149.	76.	14534.
INCHES		17.53	22.31	22.61	22.61
MM		445.26	566.60	574.21	574.21
AC-FT		8223.	10464.	10605.	10605.
THOUS CU M		10143.	12907.	13081.	13081.

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 .50
HYDROGRAPH AT	RES	8.80	1	11931.
		(22.79)		(337.85)(
			2	11931.
				(337.85)(
			3	11931.
				(337.85)(
			4	11931.
				(337.85)(
			5	11931.
				(337.85)(
ROUTED TO	DAM	8.80	1	11940.
		(22.79)		(338.11)(
			2	11934.
				(337.94)(
			3	11931.
				(337.84)(
			4	11930.
				(337.82)(
			5	11934.
				(337.95)(
ROUTED TO	EACH 1	8.80	1	11854.
		(22.79)		(335.68)(
			2	11856.
				(335.72)(
			3	11854.
				(335.68)(
			4	11852.
				(335.62)(
			5	11853.
				(335.65)(

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	252.40	252.13	255.00
STORAGE	32.	30.	55.
OUTFLOW	164.	87.	1121.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.50	257.19	2.19	81.	11940.	7.50	42.00	38.75

PLAN 2 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	252.40	252.13	255.00
STORAGE	32.	30.	55.
OUTFLOW	164.	87.	1121.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.50	256.76	1.76	75.	11934.	6.66	42.00	38.75

PLAN 3 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	252.40	252.13	255.00
STORAGE	32.	30.	55.
OUTFLOW	164.	87.	1121.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.50	256.11	1.11	67.	11931.	4.65	42.00	38.75

PLAN 4 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	252.40	252.13	255.00
STORAGE	32.	30.	55.
OUTFLOW	164.	87.	1121.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.50	256.11	1.11	67.	11930.	2.77	42.00	38.75

PLAN 5 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	252.40	252.13	255.00
STORAGE	32.	30.	55.
OUTFLOW	164.	87.	1121.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS

.50 256.11 1.11 67. 11934. 1.81 42.00 38.13

PLAN 1 STATION EACH 1

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.50	11854.	251.2	42.25

PLAN 2 STATION EACH 1

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.50	11856.	251.2	42.25

PLAN 3 STATION EACH 1

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.50	11854.	251.2	42.25

PLAN 4 STATION EACH 1

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.50	11852.	251.2	42.25

PLAN 5 STATION EACH 1

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.50	11853.	251.2	42.25